

PROCEEDINGS
OF THE
LINNEAN SOCIETY OF LONDON.



129TH SESSION.

FROM NOVEMBER 1916 TO JUNE 1917.

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PUBLICATIONS: SESSION JULY 1916-JULY 1917.

Journal, Botany.

Vol. XLIII.	No. 292.	12/-
" "	" 293.	7/-
" "	" 294.	8/-

Journal, Zoology.

Vol. XXXIII.	No. 222.	14/-
" "	" 223.	20/-

Transactions, Botany.

Vol. IX.	Part 1.	38/-
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Transactions, Zoology.

Vol. XVII.	Part 2.	23/-
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Proceedings, 128th Session, October 1916. 6/-

List of [Fellows, Associates, and Foreign Members], Nov. 1916.

PROCEEDINGS
OF THE
LINNEAN SOCIETY OF LONDON.

(ONE HUNDRED AND TWENTY-NINTH SESSION,
1916-1917.)

November 2nd, 1916.

Sir DAVID PRAIN, C.M.G., F.R.S., President, in the Chair.

The Minutes of the General Meeting of the 1st June, 1916, were read and confirmed.

Amongst the donations special mention was made of the gift of several volumes by Mrs. REID, formerly belonging to our late Fellow, Mr. James Robert Reid, C.I.E., F.L.S.

A special vote of thanks was passed by acclamation for the present by Sir FRANK CRISP, Bt., of a phototypic copy of the "Codex Vindobonensis Med. Gr. I." of Dioscorides, which was printed at Leyden in 1906.

The following were proposed as Fellows:—Mr. Sydney Frederick Armstrong, Mr. Devi Sarn Bakshi, Mr. Richard Henrik Beamish, D.L., Dr. Charles Hall Betts, LL.D., Mr. Robert Hugh Bunting, Mr. Henry Augustus Hammond Dunn, Mr. Alfred Ernest Knight, Mr. Leonard John Sedgwick, B.A. (Cantab.), and Dr. John Lloyd Williams, D.Sc.

Mr. William Williamson was elected a Fellow.

The first paper was by Prof. G. S. BOULGER, entitled "Early Chapters in Plant Distribution," in which he sketched the first
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glimpses in the works of Cardinal Bembo, M. de l'Obel, Sir Hans Sloane, Dr. Christian Mentzel, and J. Pitton de Tournefort. The last has enjoyed a reputation which his actual record as to plant distribution does not deserve, believed to be the result of an early misquotation from his 'Voyage du Levant.' The second chapter was devoted to Carl von Linné, whose 'Flora Lapponica' and several theses in the 'Amœnitates Academicæ' were brought forward in support. Next followed Haller, J. G. Gmelin, Buffon and Forskål, C. L. Willdenow, with a brief allusion to P. A. Broussonet.

Dr. STAFF suggested that reference to the works of Theophrastus Eresios, Rumpf, 'Flora Amboinensis,' and C. de l'Escluse, 'Rariorum stirpium per Hispaniam historia,' would reward the student of this subject.

The President, in thanking the author, hoped that the conclusion of his 'Early Chapters' might be given subsequently.

Mr. L. A. BORRADAILE'S paper "On the Pontoniinae and Carides from the Western Indian Ocean," and communicated by Prof. J. Stanley Gardiner, F.R.S., F.L.S., was read in title.

Mr. E. S. GOODRICH, F.R.S., Sec. L.S., gave an exposition of Prof. E. G. Conklin's ingenious theory of the cause of Reversal of Symmetry in twisted Gasteropod Mollusca, illustrating his remarks by specimens and lantern-slides.

Mrs. Longstaff, Rev. T. R. R. Stebbing, Mr. G. B. Sowerby, and Lieut.-Col. J. H. Tull Walsh raised a short discussion on certain points arising from the demonstration, Mr. Goodrich replying.

November 16th, 1916.

Sir DAVID PRAIN, C.M.G., F.R.S., President, in the Chair.

The Minutes of the General Meeting of the 2nd November, 1916, were read and confirmed.

Dr. William Thomas Elliott was admitted a Fellow.

The General Secretary, Dr. B. DAYDON JACKSON, referred to the presentation at the previous meeting by Sir Frank Crisp, Bt., of a collotyped copy of the 'Codex Aniciæ Julianæ,' in the Imperial Library at Vienna, and that he had intended to make a few remarks upon it at the time, but the very full programme of the meeting prevented his doing so. He now proposed to take up the subject, in response to requests made by Fellows. Pedanios (or Pedakios) Dioscorides was born at Anazarba in Cilicia, and

received his education at Tarsus and Alexandria. Details of his life are wanting, but it seems certain that he was physician to the Roman legions, and accompanied them into nearly every country on the north of the Mediterranean. He was a contemporary of Caius Plinius the elder, living under the emperors Nero and Vespasian, and dying about A.D. 77.

His five books on *Materia Medica* seem to have suffered at the hands of editors, and it is usual to find two additional books tacked on, which are obviously not the work of Dioscorides. The text, even in the earlier MS. known, seems to be derived from still earlier resources, possibly taking shape about the close of the 3rd Century. The celebrated 'Codex Aniciæ Julianæ' reproduced in collotype, and brought before the Society at its last meeting, is stated to have been written about A.D. 512, though freely ascribed to 40 years earlier (472). It was acquired by Busbecq, Austrian Ambassador to Turkey, and finally reached Vienna, where it now is.

A later 'Codex Neapolitanus' is also preserved in the Imperial Library at Vienna, but of about the 7th Century.

In 1763-73, engravings from the Viennese 'Codex Neapolitanus' were prepared by the Librarian Gerhard Swieten, the botanic portion under the care of Baron N. J. Jacquin. In March 1764, a set so far as engraved was sent to Linnæus for his advice; they were to be guarded carefully and shown to no one. The work was stopped at or soon after Swieten's death in 1772; four copies are known, two are at Vienna: the best copy has 410 figures, 1-383 are from the 'Codex Neapolitanus,' 384-410 from the 'Codex Aniciæ Julianæ': the second copy has only 407 figures. The copy at Oxford, given or lent to John Sibthorp in 1786, has 409 figures; the Linnean Society's copy has only 142, but these are annotated by Jacquin; possibly the promised continuation was never sent.

No author has been more commented on than Dioscorides, and of the score of commentators none has reached the reputation of P. A. Mattioli, whose works, with or without illustrations, have reached an extraordinary number of editions in various languages. His bibliographer, Moretti, states that he possessed 40 editions, and knew of 11 others in various libraries. Dr. John Sibthorp (1758-1796), Professor of Botany at Oxford, may be said to be the last of the line, the splendid 'Flora Græca,' provided for by him, and edited by our founder, Sir J. E. Smith, being finished in 1840 under the care of Dr. John Lindley.

Additional remarks were made by Mr. F. N. WILLIAMS, who referred to a note in the 'Journal of Botany,' xliv. (1906) p. 304, concerning the determination of "*Telephium*" in the Codex now under review to be *Cerinthæ major*, Linn.; he also spoke of the various notes at different times, in Armenian and Turkish, and of the help he had derived from Sir George Watt in these researches.

The Treasurer (Mr. Horace W. Monckton) and Dr. Otto Stapf

also spoke, the latter detailing some of the observations of Prof. Wellmann on the 'Codex,' and the easy identification of some of the figures in it, with the total falsity of others.

The General Secretary also took up the subject of the new cases for the Linnean herbarium, announced for the previous meeting, but postponed. He said that in the autumn of 1914 the Council took steps to guard the Linnean herbarium from damage by enemy aircraft, by storing it in the basement. This arrangement rendered consultation troublesome, and, during the past summer, the Council decided to bring the herbarium from the basement to its former position in the meeting-room. Additional security was provided by enclosing the packets of plants in a series of 21 metal cases, resting in an iron frame, and enclosed within an outer cabinet lined with sheet asbestos and galvanized steel; similar non-combustible material took the place of the glass which previously shut in the original Linnean cabinets; the three old original cabinets have now been transferred to different uses in another part of the Society's apartments.

Dr. RENDLE showed specimens and illustrative lantern-slides of *Maidenia*, a new genus of Hydrocharideæ (see 'Journal of Botany,' 1914, p. 313) allied to *Vallisneria*, found near the King River, East Kimberley, N.W. Australia, by Mr. W. V. Fitzgerald. The plants, which are submerged, consist of a slender stem a few inches high, rooting in the mud and densely covered with filiform leaves; they are dioecious. The small female flowers arise on much reduced axillary leaf-shoots and resemble those of *Vallisneria*. A single flower contained in a spathe is carried above the surface of the water by a long thread-like stalk; it consists of three purplish-red sepals crowning the ovary, with which alternate three spreading forked stigmas; there is no trace of an inner perianth-whorl or of staminodes. The ovary contains numerous erect ovules which cover the interior walls. The male flowers arise in sessile ovoid spikes, several of which are borne in the axils of adjacent leaves forming an apparent whorl. Each spathe encloses an axis bearing numerous stamens, and there is no trace of any perianth; the male spathe and its contents may therefore be regarded as comparable with a male inflorescence of *Vallisneria* in which each flower has been reduced to a single stamen. The spathe is easily detached before the anthers are quite mature, and we may assume that it is carried to the surface of the water, as are the male flowers of *Vallisneria*, and that pollination occurs at the surface of the water in a manner comparable with that described in *V. spiralis*. As in *Vallisneria* the ripening fruit is drawn beneath the surface of the water by a spiral contraction of the stalk.

Dr. Otto Stapf and Mr. J. C. Shenstone discussed some of the points raised, and Dr. Rendle replied.

A paper by Mr. ARTHUR WILLIAM WATERS, F.L.S., F.G.S., entitled "Some Collections of the littoral Marine Fauna of the Cape Verde Islands made by Cyril Crossland, M.A., B.Sc., F.Z.S., in the summer of 1904—Bryozoa," was read in title.

Dr. GEORGE HENDERSON, F.L.S., sent for exhibition three seedless pears, from a tree which practically produces no seeds; it is about 25 years old, and usually flowers twice—once very early in the season, and again two months later, both sets of flowers producing fruit, but the later ones often do not ripen. Dr. Henderson compared these pears with the cultivated plantain, but the Smyrna fig, of which he grows four varieties, does not ripen fruit unless at least one flower is fertilized by pollen from the wild fig.

November 30th, 1916.

Sir DAVID PRAIN, C.M.G., F.R.S., President, in the Chair.

The Minutes of the General Meeting of the 16th November, 1916, were read and confirmed.

Dr. Albert John Chalmers, F.Z.S., and Mr. Thomas James Evans, M.A. (Oxon.), were proposed as Fellows.

The following were elected Fellows:—Mr. Sydney Frederick Armstrong, Mr. Devi Sarn Bakshi, Mr. Richard Henrik Beamish, D.L., Dr. Charles Hall Betts, Mr. Robert Hugh Bunting, Mr. Henry Augustus Hammond Dunn, Mr. Alfred Ernest Knight, Mr. Leonard John Sedgwick, B.A. (Cantab.), and Dr. John Lloyd Williams.

Mr. JAMES SMALL, M.Sc., read a paper "On the Floral Anatomy of some Compositæ," which was communicated by Prof. M. C. Potter, F.L.S.

Mr. SMALL then gave a demonstration of "Wind dispersal Apparatus," and described it thus:—

The purpose of the apparatus is to determine the exact velocity of the wind required to blow the fruits of the Compositæ a sufficient distance to secure proper dispersal. The apparatus consists of an electric fan (the speed of which can be varied), a long, wide glass tube, and an anemometer. The anemometer consists of a beam with a disc attached, upon which the wind impinges, and a scale-pan slung over a pulley, the whole forming a mechanical couple. The pressure is measured by this instrument and converted into miles per hour.

The tube is moved away from the fan until the fruits are

no longer blown right through; the wind-pressure at this point is taken as the minimum required for the dispersal of the fruit. In this way it has been found that the following minimum winds are necessary for the dispersal of the fruits of the species named below :—

Senecio vulgaris—1·6 m.p.h.=a light air.

Senecio vulgaris, var. *radiatus erectus*—1·89 m.p.h.=a light breeze.

Ursinia speciosa—2·6 to 2·94 m.p.h.=a light to gentle breeze.

Taraxacum officinale—1·5 m.p.h.=a light air.

Tussilago Farfara—·62 to ·65 m.p.h.=less than a light air.

Centaurea imperialis—7·7 m.p.h.=a moderate breeze.

Leontopodium alpinum—4·78 m.p.h.=a gentle breeze.

Dr. D. H. Scott, Dr. E. J. Salisbury, Dr. Helen Gwynne-Vaughan, and Dr. A. P. Young engaged in a discussion, and Mr. Small replied.

Mr. T. A. DYMES, F.L.S., contributed "A Note on the Seed of *Iris Pseudacorus*, Linn."

Dr. D. H. Scott, Dr. A. B. Rendle, Prof. G. S. Boulger, Miss M. Carson, and Mr. J. Ramsbottom contributed further remarks, and the author replied.

December 14th, 1916.

Sir DAVID PRAIN, C.M.G., F.R.S., President, in the Chair.

The Minutes of the General Meeting of the 30th November, 1916, were read and confirmed.

Mr. Devi Sarn Bakshi, Mr. Robert Hugh Bunting, and Mr. Henry Augustus Hammond Dunn were admitted Fellows.

Mr. H. S. HOLDEN communicated and explained a paper by Miss ISABEL McCLATCHIE, B.Sc., entitled "Observations on the Root-System of *Impatiens Roylei*, Walp."

The paper was discussed by Dr. Ethel N. Thomas, Mr. W. C. Worsdell, Miss Carson, and Dr. C. E. Moss, Mr. Holden replying.

Dr. ETHEL N. THOMAS communicated a paper "On the Distribution of Monœcious Plants, and the Occurrence of Hermaphrodite Flowers in *Myrica Gale*, with Observations on Variations of Sex," by Miss A. J. DAVEY, M.Sc., and Miss M. GIBSON, B.Sc., which was explained by the authors.

Myrica Gale, the Common Bog Myrtle, is described as being typically diœcious, but mention has been made by several authors of the occasional occurrence of the monœcious condition.

Observations during several successive years on a large area of *Myrica* in the peat moors of Somerset show that there is always a small proportion of monœcious plants, which present all gradations between the normal pistillate and staminate types. Further, it has been found that the sex of a plant may vary from year to year.

The monœcious plants may be grouped as follows:—

(a) Plants bearing both staminate and pistillate catkins of the normal type. These occur on different shoots, or they may be mixed on the same shoot. In the latter case, usually the lower part of the shoot is staminate and the upper part pistillate, but the reverse order may obtain. Staminate, pistillate, and mixed shoots may occur on the same plant, and the proportions of each vary considerably.

(b) Plants bearing androgynous catkins. Such catkins usually contain stamens below and pistils above, but the reverse arrangement is found also.

(c) Plants whose catkins consist of hermaphrodite flowers. These flowers (like the unisexual flowers) occur singly in the axils of the catkin scales. Each flower consists of a central ovary, surrounded by 3 or 4 stamens (less commonly 2). Just below the insertion of these on the short floral axis, there are two small outgrowths corresponding to the “bracteoles” of normal pistillate flowers. The pistillate flower consists of an ovary flanked by two “bracteoles” adnate to it, which enlarge and persist in the fruiting stage; the staminate flower consists of a group of stamens (commonly four), without bracteoles.

The hermaphrodite flowers are proterogynous. They produce normal fruits, and their stamens are functional.

Variations of Sex.—Among plants or shoots marked and examined in successive years, some showed progressive change from pistillate to staminate during several seasons; *e. g.* plants producing abundant fruit in 1913 showed mixed shoots in 1914, and in 1915 became almost entirely staminate. In 1916 several such cases showed indications of the reverse change.

Some plants appear to be continually fluctuating, while others remain stable for many seasons.

Prof. Bateson, Mr. W. C. Worsdell, and Dr. C. E. Moss discussed the paper, and Miss Gibson replied.

January 18th, 1917.

Sir DAVID PRAIN, C.M.G., F.R.S., President, in the Chair.

The Minutes of the General Meeting of the 14th December, 1916, were read and confirmed.

Mr. Alfred Ernest Knight was admitted a Fellow.

Dr. Albert John Chalmers and Mr. Thomas James Evans, M.A., were elected Fellows.

Prof. F. O. BOWER, Sc.D., F.R.S., F.L.S., gave a lecture on "The Morphology of the Sorus of Ferns," the following theses being maintained and illustrated in a long series of lantern-slides of living and fossil species :—

1. The isolated sporangium (monangial sorus of Prantl) is frequent among primitive Filicales.
2. The distal or marginal position of the sorus is prevalent in primitive types.
3. The transition from a marginal to a superficial position has frequently occurred.
4. Interpolation of sporangia has led to increased complexity of the sorus.
5. In simple, gradate, and mixed sori thus constituted the receptacle varies: it is not a stable entity, but a result of elaboration of the vein-ending on which the sporangia are seated.
6. Superficial extension of sori occurs.
7. Duplication of sori also occurs.
8. Fusion of sori occurs progressively in various phyla.
9. The fusion-sorus may disintegrate, but not necessarily along the original lines of fusion.
10. The identity of the sorus may be lost by acrostichoid development, which has occurred along numerous lines of phyletic advance.
11. The more complex sori of Ferns, as they are now seen, are referable along such lines of comparison to marginal or distal monangial sori.
12. Such a position of isolated or few sporangia is found to prevail in plants of the Lower Devonian Period.
13. The marginal placentation of Seed-Plants is probably more than a mere analogy.

Dr. D. H. Scott, F.R.S., Prof. J. B. Farmer, F.R.S., and Mr. W. C. Worsdell discussed some of the points raised, and Prof. Bower replied.

February 1st, 1917.

Sir DAVID PRAIN, C.M.G., F.R.S., President, in the Chair.

The Minutes of the General Meeting of the 18th January, 1917, were read and confirmed.

Mr. Frederick Moore Clements, F.Z.S., Mr. Henry James Davies, F.R.S.A., the Rev. James Marchant, and Mr. Henry Felix Northcote, were proposed as Fellows.

The President stated that a vacancy existed in the list of Foreign Members by the death of Julius von Wiesner.

Mr. C. E. SALMON made a communication on "Some Plants that might occur in Britain," showing specimens of the plants considered likely to occur, and certain allied forms possibly to be mistaken for them. Some undoubtedly native species would seem unlikely from their European distribution to occur here, such as *Sagina Reuteri*, Boiss., and *Lloydia alpina*, Salisb., whilst it is manifestly uncertain what species may be ultimately found in Britain. He had therefore chosen the ten following species, all well-defined plants, and recognized on the Continent, leaving out consideration of microspecies for the present.

Ranunculus ololeucos, Lloyd, allied to *R. tripartitus*, DC.; *Cerastium brachypetalum*, Desp., close to *C. glomeratum*, Thuill., especially its subvariety *elongatum*; *Alsine dunensis*, Corbière, distinguishable from *A. tenuifolia*, Crantz; *Spergula Morrisonii*, Boreau, closely allied to *S. pentandra*, Linn., found in Ireland by Dr. William Sherard, and recorded in Ray's 'Synopsis,' ed. 3, p. 351; *Veronica opaca*, Fries, very near *V. agrestis*, Linn., and *V. polita*, Fries; *Rhinanthus hirsutus*, Lam., comparable with our *R. major*, Ehrh.; *Ruppia brachypus*, J. Gay, very near *R. rostellata*, Koch; *Heleocharis mamillatus*, Lindb. f., between *H. palustris*, R. Br., and *H. uniglumis*, Schultes, distinguished by their fruits, as shown in the diagram exhibited by the author; *Carex frigida*, All., previously reported from Scotland, but the plant then found is now known as *C. binervis* var. *Sadleri*, Linton; and lastly, *C. lævirostris*, Fries, nearest to *C. rostrata* of our British species.

Mr. James Groves, Dr. C. E. Moss, Mr. F. N. Williams, Mr. E. G. Baker, and Mr. R. A. Rolfe took part in the discussion which followed.

Prof. W. A. HERDMAN, F.R.S., then gave an account of a paper by Prof. J. W. DAKIN, F.L.S., on his exploration of the Houtman Abrolhos Islands.

The last communication was by Messrs. J. CHARLESWORTH and J. RAMSBOTTOM, F.L.S., "On the Structure of the Leaves of Hybrid Orchids."

An investigation of the various anatomical characters of the leaves of the parents and their hybrids—cuticle, epidermis, water-storage tissue, mesophyll, vascular bundles, sclerenchyma, structure and shape of midrib, etc.—shows that, as a general rule, a structure when present in both parents in different amounts, appears in the hybrid intermediate in every way—quantity, distribution, size and shape of parts, etc. This can be well seen by observing the microscopic characters of hybrids which have one parent in common; *Cochlidium Noebliana* occurs as the female parent in six of the primary hybrids investigated and

in the two secondary ones: the water-storage tissue and the number of rows of vascular strands show the point very clearly. When a character is present in one of the parents, it may or may not be found in the hybrid: *e. g.*, the leaf of *Epidendrum prismatocarpum* shows a large amount of crystalline substance; the leaves of the hybrid *Laelia cinnabarina* × *E. prismatocarpum* show these crystals, but not in such great quantity; the leaves of the hybrid *Laelia tenebrosa* × *E. prismatocarpum*, on the other hand, do not show any crystals. In general, if the character of one parent does occur in the hybrid, it is much less developed than in the parent.

Sections of the leaves of thirteen primary hybrids and their parents were exhibited.

♀.	♂.	Hybrid.
<i>Cochlioda Noezliana</i>	× <i>Ada aurantiaca</i> (<i>Adioda</i>).	
" "	× <i>Miltonia vexillaria</i>	(<i>Miltonioda Harwoodii</i>).
" "	× <i>Odontoglossum cordatum</i>	(<i>Odontioda Craveniana</i>).
" "	× <i>O. Harryanum</i>	(<i>Odontioda Charlesworthii</i>).
" "	× <i>Oncidium incurvum</i>	(<i>Oncidiioda Charlesworthii</i>).
" "	× <i>O. macranthum</i> (<i>Oncidiioda Cooksoniae</i>).	
<i>Laelia cinnabarina</i>	× <i>Epidendrum prismatocarpum</i> (<i>Epilaelia</i>).	
<i>L. tenebrosa</i>	× <i>E. prismatocarpum</i> (<i>Epilaelia</i>).	
<i>Odontoglossum Edwardii</i>	× <i>Cochlioda vulcanica</i> .	
" "	× <i>Rossii</i> (<i>O. Antiope</i>).	
<i>O. Uro-Skinneri</i>	× <i>Miltonia Schroederiana</i> .	
" "	× <i>O. Edwardii</i> (<i>O. Grogoniae</i>).	
<i>Vanda teres</i>	× <i>V. suavis</i> .	

Also two secondary hybrids:—

<i>Odontioda Charlesworthii</i>	× <i>Odontoglossum Harryanum</i>	(<i>Odontioda Brewii</i>).
<i>Odontoglossum Uro-Skinneri</i>	× <i>Odontioda Charlesworthii</i>	(<i>Odontioda Irene</i>).

Mr. R. A. Rolfe, A.L.S., contributed further remarks, and showed leaves of Orchids in illustration.

February 15th, 1917.

Sir DAVID PRAIN, C.M.G., F.R.S., President, in the Chair.

The Minutes of the General Meeting of the 1st February, 1917, were read and confirmed.

Mr. Richard Henrik Beamish and Mr. Thomas James Evans were admitted Fellows.

The President announced vacancies for Foreign Members caused by the deaths of Prof. Elias Metchnikoff and Prof. Alfred Cogniaux.

The President explained that Mr. R. A. ROLFE, A.L.S., had received some flowers of hybrid orchids a few hours previously, and had brought them for exhibition, but, as the whole time of the meeting had been previously engaged, this exhibition would be held in the tea-room, after the meeting.

The following is the abstract furnished by the exhibitor:—

(1) HYBRID ORCHIDS (with their parents and grandparents)
showing segregation of character.

Living flowers (13) from the same seed-pod, showing wide range of variation.

Parentage: *Odontioda Charlesworthii* (*Cochlioda Noetzeliana* × *Odontoglossum Harryanum*) × *Odontoglossum crispum*.

Paintings of seven seedlings from the same seed-pod, showing variation.

Parentage: *Odontioda Charlesworthii* × *Odontoglossum Harryanum* (one of the original parents).

Paintings of five seedlings from the same seed-pod, showing variation.

Parentage: *Odontioda Charlesworthii* × *Odontoglossum Phæbe* (*cirrhum* × *crispum*).

Paintings of four seedlings of *Lycaste Janeta* from the same seed-pod (with parents).

Parentage: *Lycaste Rossiana* × *L. Skinneri*. The segregation of character in a primary hybrid (incompatibility) is to be noted.

Paintings of sports of the primary hybrid *Cypripedium Dauthieri* (with parents).

Parentage: *Cypripedium villosum* × *C. barbatum*. Successive sports noted: (a) irregularly-striped; (b) faded; (c) harlequin-coloured; (d) green, approaching the *C. villosum* parent. Also a seedling of *C. Dauthieri*, much like the original.

(2) Species of *Cynoches* showing sexual dimorphism.

Painting of *Cynoches Warscewiczii*, showing male and female flowers on the same inflorescence (the five females at the base, a dozen males above).

With the original specimen dried.

Specimen of *Cynoches Rossianum*, showing male and female flowers on the different inflorescences of the same plant.

The altogether disproportionate size of the females was noted.

Mr. J. H. OWEN, M.A., of Felsted School, gave a lantern-lecture on "The Home-life of the Sparrow-Hawk" [*Accipiter nisus* (Linn.) Pall.], abstracted as follows:—

After a brief description of the life of the birds from Autumn to Spring, an account was given of the nesting-habits, from the selection of the nesting-site in March to the scattering of the young at the end of July or in the early part of August. A series of lantern-slides, upwards of 100 in number, was exhibited to illustrate various features of the nesting-habits and growth of the young. Of these, particular interest attached to a series showing the various methods of brooding in wet weather and the care taken over the welfare of the youngest nestling. Another series showed the young able to feed themselves, while the hen kept watch above the nest during the course of the meal until the young are all asleep after the food is finished. Slides were shown of the visits of young and the old birds to the nest after the young had left. The majority of the rest of the slides had to do with the growth of the young from hatching until they are able to tear up food for themselves.

March 1st, 1917.

Sir DAVID PRAIN, C.M.G., F.R.S., President, in the Chair.

The Minutes of the General Meeting of the 15th February, 1917, were read and confirmed.

Dr. John McEwen Dalziel, B.Sc.(Edinb.), was proposed as a Fellow, and the Abbé Victor Grégoire, Prof. Thomas Hunt Morgan, and Dr. Hans Schinz were proposed as Foreign Members.

Mr. Frederick Moore Clements, Mr. Henry James Davies, F.R.M.S., the Rev. James Marchant, and Mr. Henry Felix Northcote, were elected Fellows.

The first paper was by Mr. J. C. MOTTEAM, M.B.(Lond.), entitled "Observations upon the Feeding-habits of Fish, more especially of *Salmo fario*, and of Riverside Birds" (communicated by Prof. E. B. Poulton, F.R.S., F.L.S.).

A discussion ensued in which the following took part:—Prof. Herdman, Prof. Dendy, Mr. W. Bateson, Mr. H. J. Elwes, and Mr. F. N. Williams, the author replying.

The paper announced for reading, "The Heterangiums of the British Coal-Measures," by Dr. D. H. SCOTT, F.R.S., F.L.S., was postponed.

A letter addressed by Dr. J. C. McWALTER, Capt. R.A.M.C., F.L.S., to the General Secretary, entitled "A Note on Botany in Malta," was read by Dr. A. B. RENDLE, F.R.S., Sec.L.S. It began with remarks on the prevalence of *Oxalis cernua*, Thunb., in Malta, still as universal as it was more than twenty-five years ago, when Prof. George Henslow wrote about it (Proc. Linn. Soc. 1890-92, pp. 31-36), which is still quoted as the most recent contribution to its study. Seasons at Malta are numerous, uncertain, and erratic, but the Cape Sorrel seems most prevalent in March and April; it is now called "The English Weed." The writer then gave his explanation of the abundance of the plant, ascribed to its freely seeding; but Henslow distinctly stated that the plant was trimorphic at the Cape, while only the short-styled form was present in Malta, and no perfect seed was formed, but bulbils are abundant.

Dr. McWalter next suggested the cultivation of certain medicinal plants, of which the present supply is short, but well-adapted, in his view, for growth in Malta. "Labour is, as a rule, cheap, and though an era of prosperity now prevails on account of the war, it is thought that great distress will prevail afterwards unless useful work be provided for the people."

Additional remarks were contributed by Dr. Rendle, Mr. Elwes, and the President, who thought that the author should communicate his suggestions about the culture of medicinal plants to the Colonial Office.

March 15th, 1917.

Sir DAVID PRAIN, C.M.G., F.R.S., President, in the Chair.

The Minutes of the General Meeting of the 1st March, 1917, were read and confirmed.

Mr. Henry Felix Northcote was admitted a Fellow.

Mr. C. E. JONES, B.Sc., F.L.S., contributed a communication on "Methods of preparing Plants for Exhibition," which was illustrated by a large number of dried plants mounted on sheets and a few specimens preserved in a solution of formalin.

Treatment of Green Parts of Plants, notably Flowering Plants.—The process of treating them with a solution of copper acetate dissolved in strong acetic acid was proposed by Prof. Trail, and his directions for using a hot solution—now recognised as generally the best method—are described in the 'Kew Bulletin,' 1908 (p. 50). The object of the process is to form "permanent green compounds of chlorophyll and copper." The purer the chlorophyll, the quicker and better is the green colour obtained, therefore the fresher the plant the more successful the treatment; plants in spring, when the leaves are young and active, give better results than in autumn; deciduous-leaved plants as a rule green

quickly and well, while evergreens containing decomposition products require protracted boiling, some changing to a brown which after 20 to 40 minutes boiling gradually gives way to a green; others remain persistently brown or even change to a black. It is recommended that glass beakers should be used for treating the specimens in the boiling solution.

Drying after the greening process may be by pressure in drying paper or in hot sand, the choice depending on the texture of the plant and if it has greened readily; plants which require protracted boiling very frequently become discoloured in sand-drying.

Flowers and Coloured Fruits.—Very rarely can flowers be brought successfully through the boiling in copper acetate. Red and yellow flowers, in which presumably the colour is contained in the plastid, are occasionally good. Sand-drying has been tried with very great care, and the results obtained by some workers are very pleasing, but on the whole it has been found that colours obtained by drying in a cotton-wool press devised by Dr. Fothergill are more brilliant and may be expected to be more stable. The features of the press were described by Dr. Fothergill before the Royal Horticultural Society, and an account appeared in their Journal (March 1915, p. 40). The essential is quick drying at a fairly high temperature. Sand produces too much pressure, and does not allow the moisture to dissipate so rapidly. Specimens dried in the press lose, of course, some of their form, but appear more substantial and are more brilliant in colour.

Ferns.—Pteridophyta for the most part provide very suitable objects for greening in copper acetate. Several of the common British ferns, beech-fern, heart's-tongue, and lady-fern, require long boiling, but if picked when in rapid growth a fairly good colour can be obtained. Very successful results have been obtained with *Nephrolepis exaltata* and its varieties, which were embodied in an exhibition at the Natural History Museum, S. Kensington, to show the amount of variation obtainable within the limits of a single species.

Mosses and Hepatics.—Experiments with frondose hepatics were fairly successful, also some with foliose such as *Scapania*. Also quite a number of mosses gave good colours, but considerable difficulty arose in the drying, as the colour often deteriorated in sand-drying.

Algæ require varying treatment according to their colour. Fresh green algæ so far as experience goes can be very successfully treated with copper acetate, but for delicate algæ the following solution is recommended, giving good colour and better fixation: Copper acetate, .2 gr.; copper dichloride, .2 gr. dissolved in 100 c.c. of boiled or distilled water. The mixture is allowed to settle, when a clear solution is obtained which is used cold; the algæ are immersed 12 hours or longer. The methods adopted for treating red algæ are staining methods, differing therefore from the copper-acetate process in which the green colour is a compound

of chlorophyll and copper. Of the various stains carmine proved to be the most generally useful, in the form of Carmalum or Alum-carmine. A water solution of 1 in 50 or 1 in 100 was generally adopted. It soon loses its staining power as one specimen after another is dipped, and this gives scope for grading the colour. Immersion varies from about 10 minutes to 2 hours, according to the strength of the solution. Hæmalum may be used for red algæ that have a purple tone, in connection with Congo-red or carmalum, each stain being used independently. Carmalum is the most durable stain; specimens placed in formalin and kept on a shelf in subdued light have not materially decolorised in $4\frac{1}{2}$ years. For brown algæ, notably for *Fucus* and allied genera, fixing in picric acid is often better than treatment with copper-acetate. *Ascophyllum* turns to a pleasing green in copper-acetate; in such a case and where dried specimens such as *Laminaria* have too green a colour, it is generally possible to produce a brown tone by immersing in a solution of permanganate of potash.

These experiments have been carried out in connection with the exhibition of plants in the Department of Botany, Natural History Museum, S. Kensington, where specimens can be seen.

A discussion followed in which the participants were:—Lt.-Col. Tull Walsh, Dr. O. Stapf, Dr. A. B. Rendle, Mr. H. W. Darlington, and Mr. A. H. Maude, the author replying.

Dr. R. R. GATES, F.L.S., read his paper "A Systematic Study of the North American Melanthaceæ from the Genetic Stand-point," which was illustrated by a series of 31 photographs taken from the herbarium specimens, and by examples from the Linnean and Smithian herbaria belonging to the Society.

The author's point of view is the assumption, based upon experiment during the last fifteen years, that the variations which mark species have not been universally continuous and infinitesimal, but often definite and discontinuous. Definite variation is not necessarily orthogenetic variation, but marked variation which may occur in any, or in many, directions simultaneously. The experience gained in work on the mutations in *Oenothera* are turned to account in this group of Liliales which has not hitherto been the subject of experiment.

Pairs of species have been taken and investigated on this basis. Related genera showing marked differences in structure often co-exist side by side, showing that these differences cannot be claimed as of selective value, but have arisen from "spontaneous variation" and have been perpetuated by heredity.

The photographs illustrating the reading of the paper were taken from the Herbarium of the University of California.

The paper was discussed by Dr. Ethel N. Thomas, Dr. O. Stapf, and Dr. A. B. Rendle, the author replying.

March 29th, 1917.

Sir DAVID PRAIN, C.M.G., F.R.S., President, in the Chair.

The Minutes of the General Meeting of the 15th March, 1917, were read and confirmed.

Mr. Sydney Frederick Armstrong was admitted a Fellow.

Mr. Arthur John Fry Gibbons was proposed as a Fellow.

Dr. John McEwen Dalziel was elected a Fellow.

The President announced a vacancy in the number of Associates due to the death of George Edward Massee.

Mr. W. BATESON, F.R.S., F.L.S., delivered a lecture entitled "Prof. T. H. Morgan's Work on the Mechanism of Heredity," and summarised the results of recent work in America by Prof. Morgan and his fellow-workers on the cytology of the question, especially upon the fly *Drosophila*. The lecture was illustrated by diagrams and many lantern-slides.

Mr. E. S. Goodrich, F.R.S., Sec.L.S., and Mr. Arthur W. Sutton, F.L.S., spoke of the great interest of the lecture, and respectively moved and seconded the thanks of the Society to the lecturer, which, on being put by the President, was carried by acclamation.

April 19th, 1917.

Sir DAVID PRAIN, C.M.G., F.R.S., President, in the Chair.

The Minutes of the General Meeting of the 29th March, 1917, were read and confirmed.

Mr. Harold Downes, M.B., Ch.M.(Edin.), and Mr. James Udale were proposed as Fellows, and Mr. Albert Bruce Jackson as an Associate.

The following were nominated as Auditors for the Treasurer's Accounts to the 30th April, and were elected by show of hands:—

For the Council: Mr. JAMES GROVES and Mr. G. W. E. LODER.

For the Fellows: Mr. JOHN HOPKINSON and Lt.-Col. WALSH.

Dr. D. H. SCOTT, F.R.S., F.L.S., read his paper, "The Heterangiums of the British Coal-Measures," illustrating it by lantern-slides.

Dr. Marie Stopes interrogated Dr. Scott on certain points, to whom he replied.

Mr. E. S. GOODRICH, F.R.S., Sec.L.S., gave an account of the development of Hatschek's pit and the ciliated organ on the roof of the buccal cavity in *Amphioxus* from the left anterior coelomic sac and from an ectodermal preoral pit in the embryo and larva. Following Bateson, he compared the opening of Hatschek's pit with the proboscis-pore of *Balanoglossus* and water-pore of Echinoderms. Having sketched the development of the hypophysis and anterior coelomic sacs or premandibular cavities in the Craniata, Mr. Goodrich pointed out that these cavities have been shown by Chiarugi (1898) and by Dohrn (1904) to form a tubular connexion with the hypophysis in the embryo of *Torpedo* and *Raja*. Similar connexions between the premandibular cavities and the hypophysis have been described in Reptilia by Ostroumoff (1888) and by Salvi (1902). Mr. Goodrich then suggested that these premandibular tubes in the Craniata are the original first pair of coelomostomes belonging to the first pair of coelomic sacs, and represented by water-pores in Echinoderms, and by proboscis-pores in *Enteropneusta* and *Cephalodiscus*. The hypophysis of Craniata is represented in *Amphioxus* by the ciliated organ of ectodermal origin situated in front of the true mouth.

A discussion followed in which Prof. E. W. MacBride, F.R.S. (visitor), Mr. W. Bateson, F.R.S., and Lt.-Col. Walsh took part, Mr. Goodrich replying.

Miss NINA F. LAYARD, F.L.S., read her paper, "Wooden Scratching-tools made by an African Parrot," illustrating it by specimens and lantern-slides. She observed that it is often urged that a very long period of experiment was necessary before man finally produced anything so advanced as a Palæolithic flint tool, and even weapons of an earlier culture are not considered sufficiently vague in intention to fit the low intellectual capacity attributed to his earliest representatives. If it should come to be recognised that in the dumb creation there are instances not only of tool-users, but of tool-makers, valuable hints may be obtained as to the possible capabilities of the human tool-maker in the initial stages of his art.

Notes have been taken by the author of the behaviour of a Grey African Parrot, first in choosing out natural tools, such as pointed seeds and quills, for use as poll-scratchers, later in pointing up a match for the same purpose, and finally shaping up wood in such a way as to appear to warrant the bird's claim to be described as a tool-maker.

The contention is that if it can be proved that the Parrot, requiring an implement that would penetrate the feathers to the scalp, purposely produced a point with this object, then the border-line between the mere tool-user and the tool-maker has been crossed.

Mr. W. Bateson, the Rev. T. R. R. Stebbing, Mr. W. P. Pycraft, Lt.-Col. Walsh, and Mr. T. A. Dymes took part in the discussion, the author replying.

May 3rd, 1917.

Sir DAVID PRAIN, C.M.G., F.R.S., President, in the Chair.

The Minutes of the General Meeting of the 19th April, 1917, were read and confirmed.

The report of the Donations received since the last meeting was laid before the Fellows, and the thanks of the Society to the several Donors were ordered.

The General Secretary drew attention to an interesting volume by Charles Eliot Norton, entitled "The Poet Gray as a Naturalist, with selections from his notes on the 'Systema Naturæ' of Linnæus and facsimiles of some of his drawings," published by Charles E. Goodspeed, Boston, 1903, in octavo. His attention has been drawn to the work by Mr. G. W. E. Loder, who showed him a copy belonging to Mrs. Arthur Severn. As enquiries for the work in London proved fruitless, he enquired of our Foreign Member, Prof. C. S. Sargent, of the Arnold Arboretum, Jamaica Plain, Massachusetts, as to whether copies were still procurable. Within the last few days two copies were received, with a most cordial letter from Prof. Sargent, asking their acceptance "as a very slight token of my regard and admiration for the Linnean Society and its officers."

Mr. Walter John Dowson, M.A. (Cantab.), was proposed as a Fellow.

Mr. Arthur John Fry Gibbons was elected a Fellow, and Prof. Victor Grégoire, Prof. Thomas Hunt Morgan, and Prof. Hans Schinz were elected Foreign Members.

Mr. H. W. PUGSLEY, B.A., gave a summary of his paper (communicated by Dr. A. B. Rendle, F.R.S., Sec.L.S.), "An Enumeration of the Species of *Fumaria*, section *Sphaerocarpus*."

A discussion followed, Mr. James Groves, Mr. F. N. Williams, Mr. T. A. Dymes, and Mr. A. J. Wilmott taking part, and the author replied.

Mr. G. M. RYAN, F.L.S., read a paper "On the Flowers of the Mahua, *Bassia latifolia*, Roxb.," in which he described the tree and its products, illustrating his remarks by photographs and lantern-slides.

Dr. A. B. Rendle and Dr. O. Stapf added some further observations.

The Zoological Secretary briefly described the scope of the following papers, both of them by Dr. WALTER E. COLLINGE,

F.L.S.: (1) 'On *Paracubaris*, a new Genus and Species of terrestrial Isopoda from British Guiana,' and (2) "On the Oral Appendages of certain Species of marine Isopoda."

Mr. T. A. SPRAGUE, F.L.S., followed with a series of lantern-slides illustrative of the scenery and vegetation of the Canary Islands, from photographs taken by Mr. J. Hutchinson, his fellow-traveller, during their visit in 1913.

Dr. A. B. RENDLE, on behalf of Mr. C. D. SHERBORN, A.L.S., exhibited an autograph written in 1799 by Captain Bligh (1754-1817), the well-known victim of the Mutiny of the 'Bounty' in 1789, and who afterwards attained flag-rank as Vice-Admiral.

He also laid before the Meeting a short paper by Mr. C. C. LACAITA, F.L.S., "On two critical plants of the Greek Flora."

May 24th, 1917.

Anniversary Meeting.

Sir DAVID PRAIN, C.M.G., F.R.S., President, in the Chair.

The Minutes of the General Meeting of the 3rd May, 1917, were read and confirmed.

The report of the Donations received since the last meeting was laid before the Fellows, and the thanks of the Society to the several Donors were ordered.

Lt.-Col. John Henry Tull Walsh was admitted a Fellow.

The following were proposed as Fellows:—Henry Brougham Guppy, M.B., John Rudd Leeson, M.D. (Edin.), and Mr. Richard Mounsey, F.R.G.S.

The Treasurer placed the Annual Cash Statement (see pp. 22-24) as audited before the Meeting, and explained certain points; upon the President's motion this statement of Accounts was received and adopted.

The General Secretary reported that since the last Anniversary the deaths of 18 Fellows have been recorded or their deaths ascertained, namely:—

Wilfrid Omer Cooper.

James Donald.

Sir Howard Warburton Elphinstone, Bart.

William Foggitt.

Arthur Ernest Gibbs.

Herbert Jones, F.S.A.

Nicholas Henry Martin.

Rt. Hon. Algernon Bertram Freeman - Mitford, Baron Redesdale.	Geoffrey Watkin Smith. James Stirton, M.D. Frederic Stratton.
Daniel Oliver.	Alfred Wilby Tait, Baron de Soutellinho.
Henry Harold Welch Pearson, Sc.D., F.R.S.	Edward Taylor.
Clement Reid, F.R.S.	Roland Trimen, F.R.S.
Sir Marc Armand Ruffer.	

3 Foreign Members.

Alfred Célestin Cogniaux.	Julius von Wiesner.
Elias Metchnikoff.	

1 Associate.

George Edward Massee.

5 Fellows have withdrawn, namely :—

Leslie Gordon Corrie.	Charles Sillem.
Edith Jane Durrant.	Albert Malins Smith.
Conrad Theodore Green, M.D.	

6 Fellows removed from List, in accordance with the Bye-Laws, Chap. II. § 6.

Hon. May Evelina Collins, <i>née</i> Bainbridge.	Christopher George Kiddell.
Walter Draper.	Helen Stuart Lee, <i>née</i> Chambers.
Edward Hindle, Ph.D.	Theodore Richard Robinson.

20 Fellows have been elected, of whom 17 have qualified for admission, and 3 Foreign Members.

The Librarian's report was read as follows :—

During the year there have been received as donations from private individuals and the editors and proprietors of independent journals, 146 volumes and 649 pamphlets and parts.

From the various Universities, Academies, and Scientific Societies, with which the Society is in correspondence, there have been received in exchange 61 volumes and 569 detached parts.

The Council, at the recommendation of the Library Committee, have sanctioned the purchase of 48 volumes and 269 parts of important works.

The total additions to the Library are therefore 255 volumes and 1487 pamphlets and separate parts.

The number of books bound during the year was 198, of which 3 were in whole morocco, 86 in half-morocco, 13 in buckram, 93 in cloth, and 3 re-labelled.

The General Secretary having read the Bye-Laws governing the elections, the President opened the business of the day, and the Fellows present proceeded to vote for the Council and Officers.

The Ballot for the Council having been closed, the President appointed Dr. Lilian Veley, Mr. C. S. Nicholson, and Mr. T. A. Dymes, Scrutineers; who, having examined the Ballot-papers and cast up the Votes, reported to the President, who thereupon declared the following to be elected the Council for the ensuing year :—

Mrs. AGNES ARBER, D.Sc.; EDMUND G. BAKER, Esq.; Prof. W. BATESON, F.R.S.; E. T. BROWNE, M.A.; R. H. BURNE, Esq.; Sir FRANK CRISP, Bart.; A. D. COTTON, Esq.; E. S. GOODRICH, F.R.S.; JAMES GROVES, Esq.; Dr. B. DAYDON JACKSON; Miss G. LISTER; GERALD LODGE, M.A.; HORACE W. MONCKTON, F.G.S.; Prof. G. E. NICHOLLS; Prof. H. G. PLIMMER, F.R.S.; Sir DAVID PRAIN, C.M.G., C.I.E., F.R.S.; Dr. A. B. RENDLE, F.R.S.; Dr. D. H. SCOTT, F.R.S.; Dr. A. E. SHIPLEY, F.R.S.; and Lt.-Col. J. H. T. WALSH.

The retiring Councillors were, Mr. L. A. BOODLE, Dr. C. E. MOSS, Prof. POULTON, Dr. O. STAFF, and Comr. WALKER.

The Ballot for the Officers having been closed, the President appointed the same Scrutineers, and these having examined the Ballot-papers and cast up the Votes, reported to the President, who declared the result as follows :—

President: Sir DAVID PRAIN, C.M.G., C.I.E., F.R.S.

Treasurer: HORACE W. MONCKTON, F.G.S.

Secretaries: Dr. B. DAYDON JACKSON.

E. S. GOODRICH, F.R.S.

Dr. A. B. RENDLE, F.R.S.

The President then delivered his Address, "On the Relationship between the pursuits of our Society and the Business of Life."

TREASURER'S ACCOUNTS FOR THE YEAR ENDED APRIL 30TH, 1917.
(Presented at the Anniversary Meeting, May 24th, 1917.)

Receipts and Payments of the Linnean Society from May 1st, 1916, to April 30th, 1917.

General Account.

<i>Receipts.</i>	£	s.	d.	<i>Payments.</i>	£	s.	d.
Balance at Bankers on 1st May, 1916.....	460	12	0	Taxes and Insurance	24	19	3
Cash in hand.....	43	18	11	Repairs and Furniture	134	2	9
Interest on Investments	235	6	1	Coal, Electric Current, and Gas	73	17	1
Admission Fees	102	0	0	Salaries	730	5	9
Annual Contributions	1476	0	0	Library:—			
Compositions.....	67	0	0	Books (New Books £9 5 8)	£90	0	0
				Binding.....	33	7	1
Sales of Publications:—					123	7	1
Transactions	£110	0	11	Expenses of Publications:—			
Journals	116	13	7	Printing	£654	19	11
Proceedings and Catalogues	2	19	0	Illustrations	204	16	8
	229	13	6	Distribution	66	15	10
					936	12	5
Fellows' postal account, deposits	5	2	3	Miscellaneous Printing and Stationery	88	8	1
Donations in aid of Publications	174	11	6	Petty Expenses (including Tea and Postage)	£73	6	7
Miscellaneous Receipts	9	17	9	Fellows' postal account	3	13	7
					77	0	2
				Investment £200 War Loan 5 per cent.	190	0	0
				Linnean Medal	15	0	0
				Balance at Bankers, 30th April, 1917			
				(including £70 8 6, deposits, Fellows'	£412	16	5
				postal account)	7	13	0
				Cash in hand	420	9	5
					£2804	2	0

*Investments on April 30th, 1917.**General Account.*

£	s.	d.	
1150	0	0	Metropolitan Consolidated 3½ per cent. Stock.
42	1	5	Great Indian Peninsula Railway, Annuity Class B.
450	0	0	Forth Bridge Railway 4 per cent. Stock.
1000	0	0	Metropolitan Consolidated 3 per cent. Stock.
1200	0	0	India 3 per cent. Stock.
1000	0	0	Eastern Bengal Railway 4 per cent. Debenture Stock.
1000	0	0	Great Western Railway 4 per cent. Debenture Stock.
300	0	0	Midland Railway 2½ per cent. Preference Stock.
200	0	0	5 per cent. War Loan.

Separate Account: Investments on April 30th, 1917.

£	s.	d.	
232	5	0	Metropolitan Water Board 3 per cent. "B" Stock (Westwood Fund).
638	4	5	Ditto (Hooker Lecture Fund).
100	0	0	New South Wales 3½ per cent. Stock (Trail Award Fund).
252	18	0	2½ per cent. Consolidated Stock (Crisp Award Fund).
530	0	0	East Indian Railway 3½ per cent. Debenture Stock (Tagart Fund).

HORACE W. MONCKTON, *Treasurer.*

We have (in conjunction with the Professional Auditor, who certifies as to all details) audited the Accounts of the Society for the year ended 30th April, 1917, and found them correct. We have verified the Investments and Bank Balances.

Dated this 10th May, 1917.

W. B. KEEN, *Chartered Accountant.*

JOHN HOPKINSON,
J. H. TULL WALSH,
JAMES GROVES,
A. B. RENDLE,
G. W. E. LODER, } *Auditors.*

PRESIDENTIAL ADDRESS, 1917.

THE statement we have had presented to us this afternoon by our Treasurer has shown us that the financial condition of our Society is satisfactory. We all realize how much we stand indebted to him for the wise judgment and foresight to which this fortunate circumstance is due.

We are able to see for ourselves in what excellent condition our property and our possessions in these rooms at present are. We realize also how much we owe this to the untiring care and vigilance of our General Secretary.

We are now near the close of what has been a most successful and a particularly instructive session. We all equally realize that this has been due to the unremitting zeal and energy of our Zoological and Botanical Secretaries in thinking out the arrangements for our ordinary meetings.

We have had recounted to us the changes that have taken place in the Society since our last Anniversary Meeting. During the past year the hand of death has been heavy upon us. Three of the younger of our Fellows—Capt. Geoffrey Watkin Smith, Mr. Wilfrid Omer Cooper, and Mr. James Donald—have made the great renunciation on our behalf. One Fellow, Sir Armand Ruffer, who has been of our company for over a quarter of a century, has, we have just learned, also laid down his life in the service of his country.

In Professor Daniel Oliver we have lost a Fellow who was regarded with reverence by us all as a master of his science, as one of our medallists, and as the father of our Society. In Sir Howard Elphinstone we have lost the Fellow who succeeded Professor Oliver as the senior on our list, which position he held for only thirteen days. Among Fellows and Associates who were personal friends and whose labours have shed lustre on our Society, we have lost Mr. Roland Trimen, Mr. Clement Reid, and Mr. George Edward Masee. In Professor Pearson we have lost a friend and Fellow, all too untimely taken from us, whose past labours had led us to expect him to do still more to promote natural knowledge.

While our ballots remain open, you permit the occupant of this chair to invite your attention to some matter of interest.

Examples set us elsewhere suggest our giving some thought at this Anniversary Meeting to the relationship between the pursuits of our Society and the business of life.

What are our pursuits? The preamble to our charter of 1802 says:—"the cultivation of the science of natural history in all its branches." A bye-law tells us:—"to read and hear letters, reports, and other papers on subjects of natural history; and also, to view such productions of nature as shall be exhibited."

This bye-law, accepted as adequate in 1904, gives us no authority to discuss any communication or exhibit. Occupants of this chair exceed their reference and you condone their action. Our discussions are always interesting and sometimes useful.

We are only authorized to examine productions of nature, but we do not always observe the limitation. We have at intervals viewed with interest implements from distant lands and garlands from ancient tombs. If these belong to ethnology or archæology they also belong to natural history, not from prescriptive right but because our science has duties to other studies. The source of a tool or a fabric is more than a matter of curiosity; its determination is of scientific consequence and may be of economic value. Full knowledge of an artefact may give the ethnologist a clue to the origin of an obscure custom, or the archæologist a hint as to the kinships of an extinct race.

Our charter authorizes individual and collective effort to increase zoological and botanical knowledge. Our bye-law invites us to communicate our results for entry in our journal-books. We do not treat them like the talent which was laid up in a napkin. We publish them to help others engaged in the study of natural history. But our charter leaves us in doubt and our bye-laws do not say whether the cultivation of our science include the application of these results to the business of life.

Why does the spirit of our practice rise above the letter of our law? During the Parliamentary wars of the XVII. Century, certain of the "ingenious and curious" formed themselves into an "invisible college." Out of this, after the Restoration, grew a philosophical society to promote natural knowledge. In the statute-book of that society there is a bye-law written in 1663 which is ampler than our corresponding bye-law. This law tells members "to order, take account, consider, and discourse of philosophical experiments and observations; to read, hear, and discourse upon letters, reports, and other papers containing philosophical matters; as also, to view and discourse upon rarities of nature and art: and thereupon to consider, what may be deduced from them, or any of them; and how far they, or any of them, may be improved for use or discovery."

On comparing our own bye-law with that of our parent-society we find that we have narrowed "philosophical matters" to "subjects of natural history"; we have widened "rarities" to "productions" of nature; we have left out artefacts. Otherwise our bye-law is the older statute shorn of its injunctions. But our practice shows that, whatever the intention of our founders may have been, we take these injunctions for granted. On at least one occasion this session we "took account, considered, and discoursed of" a philosophical experiment; we do this for a philosophical observation with every picture thrown upon our screen. We "discourse upon" the papers we hear and the productions of nature we view; we even examine artefacts when these come before us. Our history is a record of deduction

from our communications and exhibits; of effort to place these at the service of others; of continued endeavour to promote natural knowledge. We have not entirely overlooked the relationship between our pursuits and the business of life; nearly one-fourth of the productions of nature viewed by us have been of economic interest. But the practical application of philosophical knowledge has not been one of our chief activities; the avowedly economic papers in our journal-books have been few.

In the XVII. Century precedence was given to use over discovery. This was natural. Every scientific activity has originated in some field where practical wit and skill were already busy. Man hunted, fished, and herded before Zoology began; he raised crops and gathered simples before Botany. He divided his time and directed his course by the stars before Astronomy; set limits to his fields before Geometry; became weather-wise before Meteorology. He forestalled science when he first built a hut, shot a bolt, or lit a fire.

Why did this Society reverse the XVII. Century sequence? As our records do not say and our practice has been uniform, the change must have occurred before our foundation in 1788. A generation prior to that date another Society was created to promote practice in industry. The work of that still active body involves the application of science in various arts and crafts. Its members from the first were informed with the spirit of progress. Science now looked to industry for help in the task of improving philosophical matters for use and felt more free to concentrate her energies on the improvement of these for discovery.

Subsequent developments have shown that due allowance was not made for the difference in outlook of those for whom natural knowledge is applied and those by whom that knowledge is obtained. Industry was not clearly distinguished from Technology. The difference between the rate at which philosophical students may promote knowledge and that at which practical men can apply knowledge was not foreseen. The devolution to industry of what science once considered her first duty tended to obscure the community of scientific and industrial interest, to accentuate the diversity of scientific and industrial purpose, and to lead the activities and energies of philosophical study and industrial enterprise into separate paths.

The industrial society which is our senior undertook one duty of science as regards every branch of natural knowledge. Our society undertook all the duties of science in one branch of natural knowledge. What was our task?

An account of the progress of botany in this country up to 1790 reveals the attitude of contemporary science towards one-half of our pursuits. That work has but one reference to the author of the "Anatomy of Vegetables," and the allusion does not relate to histology but to the taxonomic bearing of a conjecture regarding the 'attire' of a flowering plant. The work

contains no reference to the author of "Vegetable Staticks." Our pursuits did not include consideration of the structure or the working of the animal-machine and the plant-machine. Our task was confined to the study of the characters, relationships, qualities and distribution of those subjective entities which we conventionally regard as 'species' of animals and plants. Histology was still part of anatomy, metabolism a branch of physics. The society from which ours is an offshoot retained these studies in her own hands; her interest in both is still unabated.

The later history of the two studies has differed. The evolution of Cytology in the XIX. Century secured for Histology the status of a separate science whose workers take their corporate title from the instrument forged for their use by Optics. This has not impaired their readiness to help the systematic student of living forms of animals and plants, while it is to the aid of their technique that the success of systematic Palæontology is largely due.

The unnamed science of which metabolism is a branch has as yet no separate existence, though it has on the genetic side given birth to a vigorous daughter science and has on the nutritive side become the scientific basis of more than one powerful technology. The Institutes of Medicine, whose concern is with animal nutrition, we now find split into two artificial branches, physiology and pathology, whose workers view the cardinal principles of their fundamental science in the light of reason at times refracted by subjective prepossessions as to health and disease. These two technologies, whether on their practical or doctrinal sides, remain handmaids of the healing art. The corresponding vegetable technology has escaped subdivision: vegetable pathology is a bye-product of the systematic sciences Entomology and Mycology, themselves branches of natural history. On its practical side vegetable physiology forms part of the Institutes of Husbandry; on its doctrinal side this technology claims the hegemony of Botany. When this academic study compares itself with the natural history of plants it implies, by its assumption of the title "Wissenschaftliche Botanik," that the botanical pursuits of our Society are not scientific. At times vegetable physiology even suggests that the cultivation of the science of natural history, so far as plants are concerned, lies outside botany. The "Geschichte der Botanik" of one of the ablest exponents of this comparatively recent study, published in 1875, contains no reference to some of those who have done most to advance our knowledge of the relationships and the distribution of plant-forms. The interest of this judgment lies in its endorsement of the opinion, held by philosophical students in 1788, that "the natural history of plants" and "vegetable staticks" belong to distinct branches of natural knowledge.

When new natural knowledge becomes available we begin by considering what may be deduced from it and how it fits in with what we already know. In those endowed with the genius that

can "smell out the truth," this deductive activity may be too brief for outside detection, and may even be subconscious. Those so gifted may pass without visible discontinuity from one result to another. When the genius consists of "an infinite capacity for taking pains," deduction is deliberate and the intervals between its results are obvious. The activities of genius of this type are usually directed to one object. Sometimes that object is further discovery; at others it is the application of knowledge to the business of life. In the latter case it may be intended to subserve practical application only, or it may be meant to yield doctrinal results. When deduction is applied in doctrine, this may be in the form of instruction designed to train a new generation in scientific method; or in the form of education, so that others may appreciate the bearing of scientific study on the business of life. Finally, when genius of the second type is accompanied by the inborn gift of co-ordination, its object may be merely to determine the relationship between new facts and old knowledge. The history of science shows that this self-denying activity is often as conducive to progress as the discovery which renders it necessary; it has the merit of enabling others "to enter into its labours."

However knowledge be used the method of its employment must involve reasoned experiment, trained observation, or a combination of these. The syllogistic relationship between experiment and observation recalls that of the 'chick and the egg.' When man first ate unforbidden fruit, we do not know whether the experiment were made to test a theory of his own or to verify an experiment by some creature of prior evolution. Curiosity and ingenuity are so intimately related that observation and experiment are usually blended. It may be that till curiosity be aroused, ingenuity is not exercised. But it is the effect of the latter which is first apparent to the onlooker. Our instinct for experiment leads us to break our first toy and tear our first lesson-book, so that the precedence given to experiment in the XVII. Century is natural. This instinct is restrained by our parents; observation of its consequences is inculcated. Later, our guardians discourage "dabbling about" and regard "fool experiment" with disfavour. They try to discipline the instinct, and train our ingenuity to devise technique.

Curiosity may similarly develop into observation, a faculty with which we are less equally endowed. Sometimes the faculty is suppressed; it is one that can easily be inhibited. Usually it may be trained to perceive the obvious; sometimes it can be educated to appreciate what the ordinary onlooker misses. The extent to which it may be educated varies with our temperament. Many are eventually able to see what is under their noses; some come to perceive what lies ahead; a few can look beyond the fence. Those who develop this threefold vision may discriminate between ends and their means. The favoured few who can also look inwards may detect not only what happens in the green tree but what may occur in the dry.

In certain fields of scientific activity deduction and observation lend themselves readily to verification by controlled experiment; in others, like the greater part of our pursuits, verification can only be obtained by repeated and prolonged observation. Philosophical students who may use experiment enjoy advantages denied to those who are debarred from its employment. The task of the latter is slower and harder. This has led to the subdivision of philosophical studies according to method. In one category are grouped studies like pathology, physics, physiology, and others to which experimental research is applicable. In the second are placed studies like pure mathematics, astronomy and others which aim merely at describing, cataloguing, and systematizing. The examples and the qualification cited are not ours; they are taken from an official account of the terms of a recent scientific bequest.

This subdivision is clearly convenient. Some philosophical students are attracted by work which promises early realization; others, from accident or predilection, are led to devote themselves to labours more prolonged.

The classification, however, is artificial. It places studies like pathology and astronomy in different categories, though the weapons used be forged in the same armoury. The physicist describes, catalogues and systematizes the elements, detects a definite law in their relationships, and indicates a gap in the series. The chemist looks for, and discovers the adumbrated element. The pure mathematician, in calculating the orbit of a celestial body, obtains results suggesting the existence of an unknown planet, which the astronomer looks for and finds.

Our pursuits involve description and systematization, and therefore place us in the honourable company of the mathematician and the astronomer. The work of our Fellows has thrown light on the origin of species and the occurrence of these in time and in space. Even if the fields of study may not be comparable, these advances in knowledge bear comparison with those of the physicist as to the evolution of matter. If our units be frankly subjective in their delimitation, where those of the physicist are objective, this only makes our task the more difficult. The physicist advances proof of the genesis of one element out of another; the natural historian proof of the evolution of one species out of another. Both find reason to believe that the two processes are going on around us. But the physicist cannot induce the expulsions of α -particles and β -particles from the atoms of his elements, that are necessary for their transmutation into new elements. The natural historian cannot control the accession or elision of the factors of his species, that are necessary for their transformation into new species. When the physicist can transmute the elements, when the natural historian can originate species, their activities will have passed from the field of scientific research into that of industrial enterprise. What interests us now, however, is that even in

those branches of science in which experiment is most active, this method only affects the technique required to attain the results. The results themselves are secured by observation, and require co-ordination like the results arrived at in those sciences where the assistance of experiment cannot be invoked. The method by which knowledge is obtained does not affect the intellectual process involved.

When a natural fact new or old is applied to the business of life, those who employ it may desire only to benefit a particular industry, or they may also have at heart the promotion of the science which supplies the fact. Where Science and Technology are partners this diversity in outlook cannot lead to harm.

Some workers may be strictly scientific, others as strictly technological. As a rule, however, those who increase natural knowledge do much, even if unconsciously, to promote material interests; those whose work is avowedly technological do much to increase natural knowledge. These two theoretically distinct types of activity do not correspond with different kinds of knowledge. Long ago a very eminent Fellow of our Society pointed out that what is popularly termed applied science is only pure science applied to particular problems. Recently a captain of industry has observed that in ordinary practice there is no sharp line to separate pure from applied science; knowledge that has not yet been used economically from knowledge that is useful.

The stress of existing conditions has at last compelled the State to accord recognition to two types of activity, the official titles of which are "Scientific Research" and "Industrial Research." This subdivision, as one of our Fellows has pointed out, takes no cognizance of that particular type of activity which philosophical study has always considered of the utmost importance; upon which during the past century and a half science has chiefly concentrated her attention. The three types of activity recognized by him are:—the philosophical study whose purpose is to ascertain the truth with regard to the causes of things; the scientific study, utilitarian in object, which is undertaken without expectation of pecuniary reward; the technological study undertaken with the object of reaping a financial return. The first of these activities is the XVII. Century "improvement of natural knowledge for discovery" which the State still regards as a pastime no more worthy of recognition than any other type of amusement. The second is the "improvement of natural knowledge for use," considered by science in the XVII. Century to be her first duty. The third is that application of natural knowledge by industry to the arts and crafts, which, about the middle of the XVIII. Century, largely replaced the application by science herself of her own results.

The official terminology is open to objection. Scientific Research is an ambiguous term, because discovery, which does not interest the State, usually involves research and investigation. Industrial

Research is a redundancy ; this is what science knows as Technology ; what industry knows as Applied Science. But we need not discuss synonymy. The important point is that the State now realizes that there are two types of utilitarian activity, just as there are two types of philosophical activity. One of these utilitarian activities involves the provision by some one science of all the assistance it can give to every kind of industry. The other entails the adaptation from various branches of science of all the help they can supply to some particular industry. Both are technological in purpose ; both must be scientific in method. The first involves both research and investigation ; the second involves investigation but need not entail research. In both the same facts are considered, but are viewed from different stand-points. The use to which facts are put does not alter the facts.

Though philosophical study and industrial enterprise parted company in the XVIII. Century, complete detachment did not result. Appeals to science for aid continued to be made by industry. Science, in response, has advised and warned. Industry, as a result, has evolved the applied sciences. But there is a limit to what an industrial technology can do. The existing strain has affected science as it has influenced the State. Science realizes that all is not well. She feels that her duty to the business of life calls for more than the prediction of disaster, and at last recognizes that action is more helpful than invective. Philosophical study has spontaneously suggested that she and industrial technology shall take counsel together. Science is no longer content to tell industry what should be done ; she is now anxious to supply the trained assistance that is needed.

My colleague, our Botanical Secretary, has discussed this question, as regards one branch of our pursuits, in an address which deserves our gratitude. He has endeavoured to bring about a more cordial understanding between botany and its economic appliances. His own long and distinguished experience in philosophical study has led him to remark that, for many whose tastes are like his, this involves the breaking of new ground. The remedy he suggests is in effect a return to the XVII. Century attitude of science towards the business of life ; his address is devoted to the task of erecting finger-posts that guide botanists to economic paths. The spirit which informs his message does more than disarm criticism. It compels those of us whose work is mainly economic to ask ourselves if we be wholly free from blame. The economic botanist, at least, knows that in his intercourse with other sciences incidentally interested in the problems of applied botany, the statement of a difficulty on his part is all that is needed to evoke the sympathy and enlist the aid of geology, geography, meteorology, chemistry, ethnology, archæology, philology, history and folk-lore.

It is, however, one thing to arrive, during a period of stress, at a more cordial understanding than that induced under and perhaps

due to antecedent conditions. What we need is the creation of an atmosphere wherein this mutual understanding shall resist such corrosive influences as may operate when the present strain is relaxed.

Want of cordiality between philosophical and applied study is only a symptom of distemper. Though a general symptom, the present attitude of philosophical study suggests that it is not a serious one. Less general, but more acute where it is manifested, is the want of cordiality between academic and philosophical study. Usually we may apply to the academic worker the description of Chaucer, "gladly would he learn and gladly teach," and find him sympathetic towards every branch of science and every human activity. Sometimes, however, the pleasure of teaching outweighs the joy of learning; subjective differences may then be imputed to identical interests, real differences be overlooked. Our own pursuits attest the variability of this symptom. Academic zoology, a fusion of histology and comparative anatomy, is always cordial towards natural history. Academic botany, which combines with these two sciences a technology borrowed from the institutes of husbandry, is at times the reverse. When this academic study was still a novel doctrine, an opsinathic trait which might have amused the Greek and irritated the Roman was intelligible. It is gradually disappearing, and the traces that still persist may perhaps be due less to the character of the teacher than to the influence of the experimental study which this academic doctrine includes.

A more serious symptom is the modern tendency of the experimental student to belittle the activities of those who must rely mainly on observation in the task of advancing natural knowledge. Students of natural history observe in the field and there obtain zoological, botanical, and geological material. They observe afresh in the museum and describe their specimens in order that their results may be systematized for deduction. If the astronomer and the meteorologist do not collect specimens, their observatory records have to be catalogued and registered before they can be systematized.

The worker in the laboratory, carried away by the zeal which his method inspires, at times confuses the means he employs with the end he has in view. He appears to conceive that it is the experiment he conducts which leads to his discoveries. This is not so, even in the case of a successful "fool experiment." The experimental worker is apt to overlook the fact that without observation he could not record, without co-ordination he could not utilize his results. He fails to note the unconscious exercise by himself of those very faculties that the "mere observer" brings to bear on his work. It is true that in natural history we sometimes meet with the same excess of zeal, the same inhibition of the sense of relativity. Those whose task is the co-ordination of knowledge occasionally appear to regard classification as an end in itself. They waste energy in controversy as to the merits

of rival taxonomic hypotheses and consume time in discussing niceties of nomenclature. But this does not entitle the laboratory student to speak of the field-naturalist as a "mere collector"; to describe the record-work of the observatory and the descriptive work of the museum as "mere compilation." Even when the laboratory worker admits both experiment and observation to seats at the table of science, he too often tries to place observation "below the salt." This attitude involves an attempt to put asunder methods which are as much helpmeets now as they were in the XVII. Century.

More detrimental still to philosophical study is the growing modern tendency of academic and experimental science to discourage amateur effort. This tendency sometimes manifests itself even in the field of natural history. How short-sighted the tendency may be, the experience of one branch of our pursuits suggests. The profession of John Ray, Stephen Hales, Miles Berkeley, and Gregor Mendel was the cure of souls. As amateurs they placed plant-system, plant-mechanics, plant-pathology, and plant-genetics on firm foundations.

Our examination of the activities of science has made it clear that the cause of this distemper is not inherent. We must therefore look for it in the relationship which subsists between philosophical study and the business of life. The influence of this study on human affairs, though it passes through various recognizable stages, is continuous and uniform. The reactions of the business of life on philosophical study, on the other hand, are different at every stage and are complex at particular stages.

Philosophical study influences more immediately those technological activities which interpret the messages of science to traffic and craftsmanship. Through these technologies it affects industry and commerce themselves; the organized state whose duties include those of fostering and safeguarding industry and commerce; the community at large for whose benefit industry and commerce are carried on, and on whose behalf the organized state exercises authority.

When the knowledge applied is provided by an observational science, the technology involved is often a direct development of that science and the relationship between the technological activity and philosophical study is intimate and cordial. But where the technologies involved are experimental in their method, they are often evolutions of the industries which they benefit. Such technologies, moreover, may derive their knowledge from several branches of science. There is no outstanding obligation and no feeling of filial piety; towards philosophical study these experimental technologies therefore usually display an attitude of independence, occasionally one of aggression.

The case of traffic is more complex. There are two kinds of traffic—one in raw material, which precedes, one in finished produce, which follows industrial practice. Both kinds of traffic

have reacted on certain branches of observational science. In the XVII. Century philosophical study had already commenced, in observatories provided for the purpose, the systematization of natural knowledge by the astronomer and the meteorologist for the benefit of the navigator who brings to the arts and crafts the exotic productions of nature and carries abroad the results of industrial enterprise. This particular manifestation of commercial activity is now dependent on experimental as well as on observational technology. So far as the importation of exotic productions of nature is concerned, commerce has reacted upon the pursuits which engage the attention of our Society. At her instigation gardens, originally established by the simpler and the mediciner, have extended their functions so as to include the acclimatization of the animals and plants which yield exotic natural productions; museums, originally devoted to curiosities, have added to their duties those of determining the sources and assessing the qualities of such productions.

In the industrial field the intercourse is mainly confined to those branches of science in which the experimental method can be employed. The attitude towards philosophical study varies. The practical man, whose fate is now a preoccupation both of Science and the State, is guided in his action by routine and authority. His case is the more difficult to deal with because his methods are really scientific; routine is crystallized experiment, authority is consolidated observation. His instinctive attitude towards both philosophical study and technological activity is therefore intelligible. To him the philosophical student is a purposeless dreamer; the technological expert a pestilent theorist. The captain of industry, unlike the practical man, takes every opportunity to apply scientific knowledge. He does not always acknowledge his indebtedness. But this too is not unnatural; dislike of the source of an obligation is one of the traits which distinguish reason from instinct.

The attitude of the State towards philosophical study has passed through successive phases of suspicion, toleration, depreciation, exploitation. The intellectual activities of the ingenious and the curious, at one time a black art calling for penal restraint, came to be regarded as a harmless amusement. The advent of experimental technology once more called the attention of the State to philosophical study. The new utilitarian activity was regarded as science; philosophical study, not being engaged on the problem of making two blades of grass grow where one grew before, was held to be the kind of blunder which is worse than crime. To her alarm the State has now discovered that without the willing help of philosophical study she cannot fulfil her primary duty of preserving the civic liberties of the community. Realising that philosophical investigation, as contrasted with technological activity, may be of use, the State has decided to put science into harness. The portion of philosophical study has been persecution, neglect, servitude. The intelligent appreciation of discovery is still far off; science waits for the day when she "shall come into her own."

Towards that scientific study which seeks truth for its own sake, the community at large usually appears to be indifferent. Where no pains are taken to train the layman to appreciate the bearing of scientific study on ordinary affairs, things could hardly be otherwise. Towards the application of scientific knowledge to the business of life, however, that section of the community which earns its bread in the sweat of its brow is fully alive. This active interest provokes the question which so usually greets the announcement of some new scientific discovery.

The resentment which modern research at times displays when it is asked what the use of a particular discovery is likely to be, cannot always be justified. The enquiry often only reflects that attitude towards new knowledge which philosophical study considered appropriate in the XVII. century. The announcement of a new scientific fact is no doubt always an effort to improve that fact for use. But the desire to find an explanation for every human action is inherent in our nature, and the community at large is sometimes in doubt as to whether the intention underlying the announcement of a discovery be to benefit the business of life or to further the interests of the discoverer. Philosophical study has never enjoined the improvement of new natural knowledge for *réclame*. Public opinion goes further and is apt to regard such advertisement with suspicion.

Sometimes the question as to the use of a new discovery is put by those who "believe that they think." In such philistine instances the resentment of science is pardonable. The best *riposte*, as we know, is a counter query as to the use of a new-born babe. Unfortunately, it need not be permanently effective. If Carlyle be right, the babe may grow up to reiterate the demand of Dogberry.

It is, however, in the doctrinal use of knowledge that the community at large takes most interest. Its own "wise saws," and to some extent the shibboleths of its leaders, reflect the regard in which knowledge is held. It is true that the community does not think of doctrine as having a double duty to fulfil. It is not alive to the fact that the true end of teaching is to discipline our instincts and cultivate our faculties. It is mainly interested in the acquisition of knowledge as a means of "getting on." If it ever thinks of such intellectual couples as "investigation and research" or "instruction and education," the community at large accepts their components as homogeneous. Nor is there need for blame; some earnest scientific teachers stigmatize as pedantic even serious attempts to resolve these couples.

The innate generosity of one generation of mankind towards the next intensifies the effect of this attitude. The public desire is to afford equal opportunity to all and at the same time to award the palm of merit to the best. To secure this object the State, at the behest of the community, has devised the system of examination. This system has the advantage of testing the amount of information that a candidate is able to exhibit on a particular day.

This, however, is not the only use to which examination is put. It is employed as a means of estimating the capacity of the candidate to take part in the business of life after the examination. How far it can be relied upon to answer this second purpose is not clear. The State thinks so highly of the system that it is now used for a third purpose, that of estimating the efficiency of the teacher.

So far as instruction is concerned, the method of examination by expert assessors unacquainted with the temperament of the examined may be the most practicable means of arriving at the desired retrospect and forecast. It is, however, clear that as regards education, if the method of examination must be relied on, the test can only be applied by the scholar. Whether the party examined should be the teacher in presence of an expert assessor, or an assessor in presence of a certified teacher, is a question to be settled by those skilled in education, as contrasted with instruction. It may even be held that such an examination is not practicable. This does not relieve us of our duty to point out to those who profess to be experts, that until some means of testing the results of education have been devised, we must be content to take things as we find them; we must be satisfied "to reap what we sow." So long as the examiner, as opposed to the schoolmaster, "is abroad among us," so long as the present examination-system, whose merits we may admit, and its correlated syllabus-system, whose evils are indisputable, hold the field, we must accept as a substitute for 'education' what peoples more logical if not more perspicuous than ourselves, are sufficiently modest to speak of as 'public instruction.'

Many earnest philosophical students of nature are at present exercised with regard to the shortcomings of what they term a 'literary education.' When one more judiciously minded ventures to suggest that the protagonists of literary and scientific training resemble the leaders of the factions in Lilliput, masters of diction and dialectic from the opposing camps fall upon and rend him. The approved attitude of the champion of scientific doctrine is to regard his opponent as he would the fanatic who thinks the earth is flat: that of the champion of literary training is to class his adversary with the enthusiast who hopes to square the circle. If both were wrong we might echo the dying wish of *Mercutio*.

But what if both be right? As a means of instruction the facts of physical science are as useful as those of grammar and history. They cannot be more repellent to the most recalcitrant instinct than chronicles of kings and narratives of events. As mental pabulum they must be healthier than many of the histories of constitutions and peoples which now replace the older "tables of important dates." Scientific treatises may be less graceful in their diction: they are free from the risk of being partisan pamphlets writ large. As a means of education the facts of natural history can, up to a certain point, be made as effective

as those supplied by the study of man and his intellectual progress. But the facts of nature are less useful than human documents in cultivating the faculty of introspection.

These, however, are matters which really lie outside the modern controversy. Many of those who take part in it omit to define their terms. So far as literary and scientific training alike are concerned, the efforts of the teacher must be largely directed to instruction, this being all that an examination of the modern type can test. Education, as contrasted with instruction, is relegated to the playing-field. It is there that we are left to learn our real limitations; it is there that we come to realize our duties to our fellows; it is there that we obtain our opportunities of distinguishing between the amateur and the professional, and of appreciating the peculiar merits of each; it is there that we are taught to "play the game." Such education may not go far, but so far as it goes it is good.

The shortcomings of what is popularly described as a 'literary education' are real; the masters of science who point them out are shrewd and experienced observers both of men and things. But these shortcomings are not due to any inherent defect in literature. The statute which underlies our bye-law and inspires our pursuits was written when the amount of natural knowledge available was insufficient to serve as the basis of a liberal education. That statute shows us what a literary education is capable of. The real difficulty connected with the process which is the subject of so much scientific invective, is not that it is 'literary' but that it is not 'education.'

Whatever value for purposes of education the results of the philosophical study of nature may possess, these results are not at present being fully utilized. The facts of natural history and other branches of science were at one time taken advantage of in the cultivation of the faculty of observation and as a means of widening the intellectual outlook of the pupil. The work of the class-room and the laboratory is now largely confined to the training of experts. Instruction more intensive than ever goes on unremittingly and effectively. This leaves so little time for education that one result is the distemper of scientific thought whose symptoms now disquiet us.

The consideration of the etiology of this distemper has taken so long that we cannot deal with possible remedies. This is of minor consequence. Our chief concern is to know where we are and how we have got there. Many competent practitioners have offered advice; you have a plethora of prescriptions to choose from. But when selecting a remedy it will be well to adopt one likely to be of benefit both to science and the business of life. Let us put our own house in order. Let us think less of the mote in the eye of the man of letters; let us give more attention to the beam that may be in our own.

How about our own pursuits, meanwhile? We are told that in times of stress we must take care not to let ourselves be hampered by formula and precedent. The advice is wise. But before we discard either, let us be quite certain that the formula is obsolete, the precedent outworn. Let us discard that XIX. Century formula which regards 'experiment' as an activity that can be exercised independently. Let us abandon the XVIII. Century precedent, which treats 'application' as of less consequence than 'discovery.' Let us revert to the formula and precedent of the XVII. Century. Let us combine in our work as far as may be possible the methods of "experiment and observation." Let us consider it our foremost duty to apply to the business of life the knowledge acquired in the course of our pursuits.

The Rev. T. R. R. STEBBING then moved:—"That the President be thanked for his excellent Address, and that he be requested to allow it to be printed and circulated amongst the Fellows," which, after being seconded by Mr. JOHN HOPKINSON, was carried by acclamation, and briefly acknowledged by the President.

The President then addressed Mr. THOMAS GEORGE WHITE, Secretary of the Agent-General for New South Wales (in the absence of his chief through illness):—

Mr. THOMAS GEORGE WHITE,—

Mr. ROBIN JOHN TILLYARD, a citizen of the Commonwealth of Australia and one of our Fellows, in his recently published papers, "Life-Histories and Descriptions of Australian *Æschinæ*" and "A Study of the Rectal Breathing Apparatus in the Larvæ of Anisopterid Dragonflies," both contained in the thirty-third volume of our Zoological Journal issued in 1916, has not only greatly increased our knowledge of the species, distribution and affinities of the Australian Dragonflies, but has with remarkable success studied the detailed microscopical structure of their breathing organs in different stages of development. In the elucidation of this material, which is particularly difficult to deal with, Mr. Tillyard has made use of refined and improved methods of histological research. The results obtained by this painstaking work have been of great value in determining the phylogenetic relationship of the various groups of Dragonflies.

It is now my pleasant duty to ask you to transmit to Mr. Tillyard the Crisp Award and Medal, conferred upon him by the Council of this Society for the best paper dealing with Microscopical Research published by the Linnean Society since the previous award given in May, 1912.

The President then addressed Mr. HENRY BROUGHAM GUPPY, M.B., and related his service to Biology, which had caused the Council to award the Linnean Gold Medal to him :—

Mr. HENRY BROUGHAM GUPPY,—

I have much pleasure in presenting to you on behalf of the Society our Linnean Medal, which the Council has awarded you for your work in those branches of science in which we are especially interested.

This work has extended over many years and been carried out in widely distant fields.

Early in your career you took advantage of your position as a Surgeon in Her Majesty's Navy to make important investigations in the Far East. In 1878 you visited the Corean Archipelago, and also made geological and meteorological observations in China, Formosa, and Japan. Then, as Surgeon on H.M.S. 'Lark,' commissioned for survey work in the Western Pacific, you had the opportunity of spending some time in the Solomon Islands. The results of your careful and extended observations appeared in 1887, in your account of the ethnology, natural history, and geology of the Islands; your observations on coral-reefs were published shortly before by the Royal Society of Edinburgh.

In 1888 you visited the Cocos-Keeling Islands for the purpose of making a detailed study of the coral formation there, and your work resulted in a highly important contribution to a subject of great interest.

But the results obtained by you which have especially arrested the attention of the Fellows of our Society are contained in two works, the first of which was published in 1906, the second this year. The former work embodied the results of your studies during three years spent in the Pacific Islands: the first volume, dealing with the geology of Vanua Levu, lies outside our province; the second, entitled "Plant Dispersal," while discussing matters affecting the distribution of plants in general, approached the subject more especially in relation to the littoral floras of the Pacific Islands and the part played by floating fruits and seeds in building up these floras.

The recent work "Plants, Seeds, and Currents in the West Indies and the Azores" is an account of your prolonged study of the factors governing the distribution of fruits and seeds by ocean currents, as illustrated by the littoral flora of the West Indies and by the flora of the Azores.

These two works, in which you have brought together a vast number of facts, are a mine of wealth for the student of plant-distribution; while the deductions which you have made from those facts are helpful and stimulating.

We remember, too, your good work done at home, some of the results of which have been communicated to us in this room and have been published in our Journal. I refer to your papers

on "The River Thames as an agent in Plant Dispersal," read June 16, 1892, and on "The Habits of *Lemna major*, *gibba*, and *polyrhiza*," embodying the results of three years' systematic observation of these small water-plants in the South-east of England, read May 3, 1894.

In asking you to accept this Medal, the highest award that the Council of this Society can offer you, may I also express the cordial wish, which we all share, that you may long remain with us to continue the painstaking work in which you have shown so much enthusiasm and to which you have devoted so many years of your life.

The recipient briefly expressed his thanks for the great honour thus conferred, and hoped that he might be able by future work to justify the choice of the Council.

The General Secretary having placed the Obituary Notices in his hands, on the table, the proceedings ended by the President reminding those present of the special circumstances of the next Meetings on the 7th June, the last of the present Session.

OBITUARY NOTICES.

The death of SARAH MARTHA BAKER on May 29, 1917, at the early age of twenty-nine adds another name to the list of young and energetic workers who the Botanical world has recently lost. Her career as an ecologist and physiologist was one of exceptional promise, and algologists specially have lost a colleague who could ill be spared.

Miss Baker was brought up as a Friend, and in her early days was desirous of studying medicine with a view to missionary work in the South Sea Islands. The plan was abandoned, in deference to her parents' wishes, and she entered University College, London, as a student in 1905, and took her B.Sc. in Chemistry with Botany in 1909. After graduating she specialised in Botany and received her D.Sc. in 1913 for a paper on "Quantitative Experiments on the Effect of Formaldehyde in Living Plants," published in the 'Annals of Botany' the previous year. For several years and up to the time of her death she was Quain Student and Lecturer in Botany at University College. She was elected a Fellow of the Linnean Society on the 4th June, 1914.

Four papers were published by Dr. Baker on the ecology of the Brown Algæ, and these have materially advanced our knowledge of this interesting subject. The first two, "On the Causes of the Zoning of Brown Seaweeds on the Seashore," were published in 1909 and 1910, and dealt with the zoning of the open coast. They were partly descriptive, the vertical zones

of a given locality being precisely determined, and partly experimental, an explanation of the causes of the phenomena observed being sought for by means of cultures and laboratory examination. The other two papers concerned the Fucaceæ of the Salt Marsh. The first (Journ. Linn. Soc., Bot. xl. 1912, pp. 275-291) gave an account of certain Marsh Fucoids at Blakeney Point and elsewhere; and the second, in collaboration with Miss M. H. Bohling (Journ. Linn. Soc., Bot. xliii. 1916, pp. 325-380), was of very wide scope, and formed the most important general contribution to the subject yet published. The authors give first an excellent and critical systematic revision of the salt-marsh fucoids, for which their ecological training especially fitted them; secondly a discussion, based largely on experimental work, of the relation of the physical factors of the habitat to the peculiar morphology of the various species which occur; and lastly, a general account of the distribution of these fucoids in connection with such problems as pioneer vegetation and coast erosion.

Of purely physiological work Miss Baker's most important research—on water-entry and transport in trees—is, though fully written up, still unpublished. She also maintained an interest in Silver Leaf, though latterly she held somewhat different views to those expressed in the note published in 1913, in which the ingenious method of using the enzyme of *Coprinus* spp. as a cure for this disease was described.

Miss Baker was one of the principal and most enthusiastic workers of the Blakeney Point Survey, where her persistence and high sense of duty were admired by all. As a teacher she was no less successful than as an investigator, her lectures being marked by extreme lucidity, as those who heard her two papers at the Linnean Society will have gathered. Her contributions to science were characterised by originality and thoroughness, and by her sympathetic interest in all branches of botany as well as in social and other problems, her loss will be widely felt, but especially by that school of Botany in London to which she was so warmly attached and by which she was so fully valued and appreciated.

[A. D. COTTON.]

ALFRED CÉLESTIN COGNIAUX, who died at Genappe on the 15th April, 1916, aged 75, was born at Robechies, Hainault, on the 7th April, 1841. After passing through a local school, in 1852 he became a pupil at the Normal School at Nivelles. In 1861 he successfully passed the examination for a teacher, and the following year received the diploma, and leaving Nivelles, spent a busy ten years as teacher at various places, as Borinage and Philippeville, in 1863 producing his first botanic paper on *Nitella tenuissima*, in the Bulletin de la Société Royale de Botanique de Belgique, where many of his shorter papers, dealing with local botany, were printed. The year 1872 witnessed his call as Conservator of the Brussels Botanic Garden, remaining there till 1880, when he became Professor of Natural History in Jodoigne for four years, when he

migrated to Verviers. Meanwhile he had shown his liking for the Cucurbitaceæ by printing two fasciculi of his "Diagnoses de Cucurbitacées nouvelles" in 1876-77, in the *Mémoires Couronnées* of the Belgian Academy. The year 1881 was signalised by his monograph of that order, which appeared as the third volume of De Candolle's 'Monographs'; he published a few papers on these plants in following years, and on the Melastomaceæ, of which order he drew up an account which constituted the seventh volume of De Candolle's 'Monographs' in 1891. Whilst at Verviers he acted as Vice-Consul for Brazil; he also produced the account of the Melastomaceæ in Martius's 'Flora Brasiliensis' from 1883 to 1888, the Cucurbitaceæ in 1878, and the Orchidaceæ from 1893 to 1906. On the 24th May, 1900, he was elected Foreign Member of the Linnean Society, and in 1903 received the diploma of Doctor from the University of Heidelberg.

In 1901 Cogniaux retired from his chair at Verviers on a pension, which enabled him to devote the whole of his time to botany on settling at Genappe. His 'Dictionnaire iconographique des Orchidées,' from 1896 to 1907, chiefly from cultivated specimens, is a useful work, but its use is restricted by an awkward shape and the method of issue. Soon after this was started, he began his 'Chronique Orchidéenne, Supplément mensuelle,' from 1897 onwards.

His latest completed work was on the Orchids of the West Indies, which came out in the sixth volume of Urban's 'Symbolæ Antillanæ' in 1909-10.

After this he returned to his former love, the natural family of Cucurbitaceæ, and, in spite of declining health, he had completed the first volume of his revision, when death overtook him, as previously stated. [B. D. J.]

WILFRID OMER COOPER, who was killed in action in France in September 1916, was one of our youngest Fellows, his election taking place on the 16th of the previous March, and formally admitted 6th April following. From a boy he was devoted to field zoology, and though his early education was under a tutor and not in any school, he developed into a naturalist, relating his field notes in the pages of the 'Zoologist' and using his microscope in the modern manner.

Although he came of an eminently peaceful family, at the outbreak of the war he was convinced that he must join; his papers for a commission having been mislaid, he joined as a private, and though later selected as a candidate for lieutenant's rank, his death cut short that intention. He was described as just the man to lead his men: a splendid disciplinarian, resourceful, quick to note events, and tenacious.

Born in 1895, he was only in his 22nd year when his life, so full of promise as a naturalist, was ended.

[Since the foregoing account was written, the 'Proceedings of the Bournemouth Natural Science Society,' 1915-16, has been

published; it contains not only an appreciation of our late Fellow (pp. 70-72) but his last papers—"Some rare and interesting local Isopods," and "Preliminary list of the marine and freshwater Isopods recorded from the Bournemouth area."—B. D. J.]

Sir HOWARD WARBURTON ELPHINSTONE, third Baronet, was born in London, 26th July, 1830, the eldest son of the second baronet, and succeeded to the title in 1893; for thirteen days he was the Senior Fellow of the Linnean Society, in succession to Prof. Daniel Oliver, and died at his house, Struan, Wimbledon Park, on the 3rd January of the present year.

From Eton he proceeded to Trinity College, Cambridge, graduating as 17th wrangler in 1854. He was called to the Bar from Lincoln's Inn in 1862, and subsequently became Lecturer to the Incorporated Law Society from 1869 to 1871, Professor of Real Property Law to the Inns of Court, 1889 to 1892, and Reader on the Law of Real Property, Inns of Court, 1892-96. He was Conveyancing Counsel to the Court, 1895 to 1914, when he retired from practice.

He was author of several legal handbooks, and in 1872 issued his 'Patterns for Turning'; photography was another of his relaxations. His election as Fellow took place on the 17th February, 1859. [B. D. J.]

WILLIAM FOGGITT was born on February 2, 1835, at Yarm, on the Yorkshire side of the Tees. His father moved to Thirsk, the chief town in the Vale of Mowbray, when William was about a year old, and started a chemist and druggist's business in the Market Place. William went first to the local school, then to a school at Tadcaster. At an early date he fell in with John's 'Flowers of the Field' and began to press and collect plants. He came home, went into his father's business, and in due time was made a partner. There were several young men at Thirsk interested in Natural History, and they formed themselves into the Thirsk Natural History Society, and carefully explored the surrounding country, both the lowlands and the Hambleton Hills. One of his early friends was J. G. Baker, and these two joined the London Botanical Society. When the Society came to an end, they carried on the distribution of plants from Thirsk, and this was the commencement of the Botanical Exchange Club, which has now been in existence more than fifty years.

William Foggitt was very keen-sighted, and had a splendid memory, and whatever he took up he did most thoroughly. He was a very good British botanist, though he wrote comparatively little. He was one of the principal authorities on the plants of the fascinating Vale of Mowbray, and he frequently explored Teesdale and Yoredale.

He wrote an account of the Botany for two local books by Edmund Bogg, one on the Vale of Mowbray, the other on Yoredale. In conjunction with J. G. Baker, in 1866, he wrote the curator's

report of the Thirsk Botanical Exchange Club for 1865, where will be found an interesting comparison of *Viola permixta* with *V. odorata*, also an account of *Galium vero-elatum* with *G. elatoverum*, and a comparison of *Thymus Serpyllum* with *T. Chamædrys*. He was made a J.P. some years ago, and was an ardent Wesleyan, and Circuit Steward of the Thirsk Circuit. He died May 10, 1917, at the age of 82, and was interred in the Thirsk Cemetery.

[E. G. BAKER.]

LORD REDESDALE.—It is with sincere regret that we record the death of Lord Redesdale, G.C.V.O., K.C.B., in his eightieth year. Elected a Fellow of the Society on the 5th November, 1896, he brought with him a varied experience gained in diplomacy, foreign travel and administrative service, which, combined with singular personal charm and remarkably good looks, rendered him a notable and popular figure in English society.

Born on the 24th February, 1837, Algernon Bertram Mitford was the son of Henry Reveley Mitford, of Exbury, by his wife Lady Georgina, fourth daughter of the third Earl of Ashburnham. Educated at Eton and Christ Church, he entered the Foreign Office in 1858 and was attached to the Embassy at St. Petersburg in 1863. In 1865 he was attached to the Legation at Peking, whence he was transferred in the following year to that at Yokohama under Sir Henry Parkes. In Japan, as he had previously done in Russia and China, he applied himself to study of the language, and acquired such mastery of it that, when the Duke of Edinburgh visited Japan in 1868, Mitford acted officially as his interpreter. He was, indeed, one of the most accomplished linguists of his time. Returning to England in 1870, he retired from the diplomatic service in 1873, and in the following year Mr. Disraeli appointed him Secretary to H.M. Office of Works. It is to his influence in that sphere that we owe the progressive adornment of the royal and public parks of London, now temporarily arrested during the great war.

Mitford's duties in his new capacity brought him into close relation with the late Sir Joseph Hooker, who was then Director of Kew Gardens, and by whom he was speedily imbued with an ardent interest in horticulture, which continued as his ruling passion till the end of his life.

The opportunity for indulging that passion, untrammelled by official duties, came to Mitford in 1886 on the death of his cousin, the second Earl of Redesdale, through which he succeeded to Batsford and the other estates. Being then in his fiftieth year, he resigned his appointment at the Office of Works, took up his abode at Batsford, on the outskirts of the Cotswolds, where he built a large and beautiful mansion-house, and created, at immense labour and expense, a very remarkable garden. Through a featureless hill-side facing the house he caused a long and deep ravine to be excavated; water was brought through pipes from a considerable distance to form a rivulet to course through the ravine,

whereof the sides were soon clothed with a luxuriant growth of alpine and other flowering herbs. Nor was this all. Mitford, whose sojourn in Japan had impressed him with the decorative qualities of bamboos, became a pioneer in the cultivation of these giant couch-grasses in this country, and soon had more than forty species thriving in his woods. His love for this class of plant, previously seldom to be seen in English pleasure-grounds, bore valuable fruit in the form of a book entitled 'The Bamboo Garden,' published in 1896. In preparing this, his only permanent contribution to scientific literature, Mitford was in constant communication with those enterprising collectors, Messrs. Veitch, M. Latour-Marliac, and the brothers Villa of Genoa; and he was assisted in the classification of species, hitherto very imperfectly understood, by Sir Joseph Hooker and Sir William Thiselton-Dyer. The book found many readers, for it combined sound botanical and cultural information with an agreeable literary style, which also distinguished those narratives of travel and reminiscence which came from the same hand.

Mitford entered Parliament as Conservative member for the Stratford Division of Warwickshire in 1892, but he declined to seek re-election after the dissolution in 1895 on account of increasing deafness, which proved a sad drawback in intercourse with his numerous friends during the later years of his life. In 1902 he was raised to the peerage in the title of Baron Redesdale of Redesdale, in Northumberland. He accompanied Prince Arthur of Connaught on the Garter Mission to Japan in 1906, being thus one of the very few well-educated Englishmen who could speak and write from experience of the sweeping changes effected in that country by the revolution of 1868.

Lord Redesdale married in 1874 Lady Clementine Ogilvy, daughter of the seventh Earl of Airlie, by whom he had five sons and four daughters. His eldest son, Major the Hon. Clement Freeman Mitford, D.S.O., 10th Hussars, was severely wounded in the South African War, and was killed in action in May, 1915; and the second son, the Hon. David Freeman Mitford, now on active service in France, was also seriously wounded in South Africa.

It will be apparent from this brief outline of Lord Redesdale's career that professional and official duties left him no leisure to apply to scientific study until he had passed the meridian of life. But Sir Joseph Hooker, in dedicating to Lord Redesdale volume cxxiii. of the 'Botanical Magazine,' bore testimony to the good service rendered to science by him, "giving me as it does the opportunity of recalling the years of our cordial official co-operation, when the Royal Gardens profited so greatly in every department through your energy, foresight, and love of plants. To this claim I must surely add the service you have rendered to horticulture and botany by your labours in introducing, cultivating and studying the hardy bamboos." [HERBERT MAXWELL.]

ARTHUR ERNEST GIBBS was born in the year 1859, the elder son of Mr. Alderman Richard Gibbs, J.P., of the Hollies, St. Albans, and was educated at Warwick and Worthing. On leaving school he entered the offices of Gibbs and Barnford, a local firm of printers, with which his family had been connected for several generations. His father having established the 'Herts Advertiser,' young Gibbs passed to the journalist side of the business, and became editor and co-proprietor, and to the last he kept a general oversight of the paper, after ceasing to be editor.

As a boy he began collecting lepidoptera, and that taste remained with him to the end of his life, and he had travelled practically over the whole of Europe in search of specimens. He had explored the Balkans entomologically, and on the outbreak of the present war he was at Lyons outward bound, and reached home after exceptional difficulties.

In 1885-6 he copied the whole of the manuscript flora of the late Alfred Reginald Pryor, F.L.S. (1839-1881), arranging the localities in districts and to a settled sequence, thereby facilitating the labours of the editor, the present writer of this notice.

Mr. Gibbs had been a member of the Hertfordshire Natural History Society since 1879, and had served as Secretary; in 1915 he was elected President, and for his Presidential Address in 1916 he selected "The Satyrid Butterflies of Hertfordshire, with a short study of *Pararge aegeria*"; for his second and concluding address, he had chosen a study of certain dialect words and phrases of his native county, a design he could not carry out, for his death cut short that project. He died on the 3rd March, 1917, and was buried on the 6th.

His love for entomology has been mentioned, and his active help in botany also; he had some knowledge of geology, and the bent of his relaxation may be gauged by the societies to which he belonged. He was elected Fellow of our Society, 18th March, 1886; of the Entomological in 1906, serving on its Council 1912-14, and had been recently re-elected for a second term; of the Zoological Society in 1912, and the Royal Horticultural Society. He also belonged to the South London Entomological and Natural History Society from 1909, and was a Vice-President. A widow and three daughters survive the husband and father, whose energetic services in the cause of his native place has evoked widespread sympathy for his family. [B. D. J.]

Although Mr. HERBERT JONES had been a Fellow since 19th February, 1891, was a frequent attendant at our meetings, and belonged to the West Kent Natural History Society, it must be admitted that his strongest bent was towards archæology. He was born in 1839, educated at private schools at Brighton and Waustead, and studied in Germany. He bestowed much attention to the excavations at the Roman city of Silchester, and was constantly to be found at the display of finds when exhibited at

the Society of Antiquaries, of which he was a Fellow ; his interest in the excavations at Silchester resulted in the acquisition of material for the reports made by Mr. Clement Reid on the plant-remains found on that site.

He died in his house at Blackheath, after five days' illness of acute pneumonia, on the 3rd October, 1916, and was buried at Shooter's Hill Cemetery. [B. D. J.]

Lieut.-Colonel KANOBA RANCHODDÂS KIRTIKAR, I.M.S., was born in 1850, and after a brilliant career at school, he spent three years in the Grant Medical College at Bombay. In 1874 he came to England to finish his medical education, and distinguished himself at University College, Gower Street. In 1876 he qualified for medical practice, and in the year following he was successful at the I.M.S. examination. He chose Bombay and served with native Indian regiments at Sholapur, Karachi, and Hyderabad. He saw service in the second Afghan war, and was present at the historic fight of Maiwand, being afterwards awarded the Afghan medal and clasp. On returning home he became Civil Surgeon at Thana, and in 1886 Assistant Professor of Anatomy in Bombay, the next year Professor of Materia Medica, and subsequently acted as Professor of Botany. After twenty-seven years of service he retired on reaching the age of 55.

His chief works are his 'Poisonous Plants of the Bombay Presidency,' which was partly illustrated by himself, and, along with Major B. D. Basu, 'Indian Medicinal Plants,' a book of 1000 quarto plates now passing through the press. He was one of the founders of the Bombay Natural History Society and secretary of its botanical section. The Moss *Bryosedgwickia Kirtikarii*, Card. & Dixon, was named after him, the authors stating that his "contributions to the botany of South India are numerous and valuable, and who has collected a number of interesting mosses from the Poona and Bombay districts." He was elected Fellow, 2nd March, 1893, and died on the 9th May, 1917, of consumption. [B. D. J.]

NICHOLAS HENRY MARTIN, J.P., of Ravenswood, Low Fell, Gateshead, was a member of the firm of Brady and Martin, Ltd. for forty years. He was born in Cornwall in 1847, and served his apprenticeship with a Penryn chemist, after a grammar-school education. He was an insatiable reader, and conned all available books, including Bentley's 'Manual of Botany,' and, with it as a guide, became acquainted with the common plants of the neighbourhood. During his apprenticeship his father died, and our late Fellow came to London in May 1867, and took a situation in Bruton Street at a salary of £30 a year indoors. Out of this slender emolument, in the following October, he paid the fees for courses of lectures on chemistry (Redwood) and botany (Bentley) at the Pharmaceutical Society in Bloomsbury Square. He passed his Minor examination in February 1868, and in May

he passed to the employment of Mr. Henry Deane, F.L.S., at Clapham, one of the original Fellows of the Royal Microscopical Society. He was anxious to complete the botany course and attend the lectures then given at the Royal Botanic Gardens, Regent's Park, but his employer refused him permission, on the plea that he could not be spared. This spurred him on to further reading, though business hours were from 7 a.m. to 9.30 p.m., 2 a.m. to 6 a.m. being the time he allotted to sleep, until 12th December, 1868, "when I passed the Major in honours. When Mr. Deane, who was an examiner, came home that evening he greeted me very warmly, and said, 'Martin, I am as proud of you to-day as if you were my son.' It appears that I obtained the highest marks of the session. Daniel Hanbury, who lived at Clapham, and who had examined me, came into Deane's shop specially to congratulate me. . . . I stayed at Mr. Deane's the next four or five years until I went into business on my own account and . . . I continued scientific work and mounted during that time about 1000 microscope-slides. On my off-evenings one winter I . . . examined several batches of dredgings . . . So my attention was turned to Foraminifera."

Mr. Martin's partner, Henry Bowman Brady, was an eminent authority on Foraminifera, and the 'Challenger' dredgings were consigned to him for examination and report, which came out in the 9th volume of the quarto reports in 1884.

Mr. Martin served on the Council of the Pharmaceutical Society, and presided at Pharmaceutical Conferences at Oxford and Bournemouth in 1894-5, and his addresses were highly appreciated. Since 1898 he had been Justice of the Peace for Newcastle-upon-Tyne. He threw himself energetically into educational matters, and being a fluent and rapid speaker, he was somewhat of a terror to the local reporters. He rarely came to London without paying a visit to the Society and its meetings. He was elected a Fellow on the 3rd March, 1881. He died on the 5th July, 1916, and was buried on the 8th at Jesmond Old Cemetery. A characteristic portrait will be found in 'The Chemist and Druggist,' vol. ix. p. 135, whence some of our information has been obtained.

[B. D. J.]

GEORGE EDWARD MASSEE, the well-known mycologist and plant-pathologist, was born at Scampston in Yorkshire about the year 1850. At the age of ten he was sent to school at York. It is interesting to note that even in his early days he showed a talent for drawing and a love of natural history, gaining at the York School of Art a national medal, and when about seventeen years old publishing a paper on Woodpeckers in the 'Intellectual Observer.'

He disliked the idea of following his father as a farmer, and, eager for adventure, readily accepted the offer of Richard Spruce, who was a relative of his mother, to accompany him on his expedition to South America. On this trip he collected plants on the

banks of the Amazon and also visited Peru, Ecuador, Colombia, and the West Indies. On his return to England he took up teaching, and he continued his botanical work, making a special study of Cryptogams. His artistic powers became manifest through the publication of his beautiful drawings in Spruce's '*Hepaticæ Amazonicæ et Andinæ*.'

During this period of his life Massee came into contact with the late Dr. M. C. Cooke, and under his guidance made great progress with the study of fungi and plant diseases, a subject in which he was already much interested. In later life he gracefully acknowledged his indebtedness to Cooke by dedicating to him his '*European Agaricacæ*' (1902). Although he had published several important morphological and systematic papers, Massee's noteworthy contributions to mycology began in 1891 with the appearance of his '*British Fungi, Phycomycetes and Ustilagineæ*.' In 1892 he published his '*Monograph of the Myxogastres*.' In the same year appeared his first volume of the '*British Fungus Flora*,' a work which has perhaps been the most useful of any of his systematic treatises. Unfortunately four parts only of this were published.

Massee was appointed to the Kew staff in 1893. He succeeded M. C. Cooke in charge of the Cryptogamic Department of the Herbarium, and held the post till his retirement.

It was with the completion of his work for the '*British Fungus Flora*' that Massee appears to have turned seriously to pathology, papers on this subject appearing continuously after 1895. Up to the year 1899 the two works on plant diseases available for English workers were Worthington G. Smith's '*Diseases of Farm and Garden Crops*,' and the most useful translation of von Tubeuf's '*Pflanzenkrankheiten*' by William G. Smith. The former was very limited in its scope, and the latter, though comprehensive, was scientific and technical and lacked the advice as to remedies so eagerly sought for by growers. Massee's '*Text-Book of Plant Diseases*,' published in 1899, aimed at supplying both the means of recognition of diseases and the methods of their control, and, covering a large range of plants, it at once took front rank in the literature of the subject. It has been very largely used by both botanists and horticulturists, and a second edition was issued in 1903. The work brought the author into touch with pathologists in all parts of the world, and papers on tropical and colonial diseases figure largely among the vast number of publications on plant diseases which he subsequently produced. In 1910 his other well-known work '*Diseases of Cultivated Plants and Trees*' appeared.

Despite his output on phytopathology Massee found time to continue to produce works on systematic mycology. '*European Agaricacæ*,' a concise and useful synopsis, appeared in 1902, and the semi-popular '*British Fungi and Lichens*' in 1911. The more general volume '*A Text-Book of Fungi*' was published in 1906, and his last work, '*Mildews, Rusts, and Smuts*,' written in conjunction with his daughter, Miss Ivy Massee, appeared in 1913.

Massee's work has left its mark on British mycology. He followed up the work of Cooke, and has supplied the English student with a series of volumes giving the most complete account of the British fungus flora yet published. Coming into the field at a time when the microscope was being used much more largely both by amateurs and scientists, most of his original work will be found to be of a type very different from that of Cooke. Even in his early days he was not afraid to discard old systems and fearlessly to adopt microscopic characters for the differentiation of certain difficult genera, and in many of his works his liking for the groups of microscopic fungi is obvious. In this way he forms a link between the older mycologists and the modern school who have had all the advantages of the modern methods of pure culture and refined microscopic technique. Massee adopted himself considerably, and in passing judgment on his work the date of his training should be borne in mind.

No one was more fully alive to the importance of field-work than Massee, and in his early days he was an enthusiastic collector. He was largely instrumental in founding the British Mycological Society and was its first President. In later life attacks of influenza, to which he was liable for many years, hindered his enjoyment of fungus forays, though he made a point of always attending the September meeting of the Mycological Committee of the Yorkshire Naturalists' Union, of which he was President. He received the Victoria Medal of Horticulture from the Royal Horticultural Society in 1902. He was a Fellow of the Linnean Society from 1895 to 1915. On his retirement from Kew he reluctantly left the Society, but was elected an Associate the following year.

Massee was a remarkable man in many ways. His intuition with regard to the affinity of a fungus amounted almost to genius, and this coupled with an unusually good memory gave him an extraordinary wide knowledge of fungi. His artistic powers also were quite exceptional. The originals of many of his drawings were exceedingly beautiful, and the ease and rapidity with which they were executed was astonishing. He had the power, too, of recalling appearance, and could portray without the slightest difficulty a whole series of fungi from memory. He was reserved, yet quick and shrewd, and usually very outspoken. As a worker he was energetic and industrious, and had withal a keen sense of humour, and was greatly missed by his colleagues on his retirement from the Herbarium in March, 1915. He died at Sevenoaks on February 17, 1917, after a brief illness. [A. D. COTTON.]

ELIAS METCHNIKOFF.—The work of the great Russian zoologist Elias Metchnikoff, who died in Paris on July 15, 1916, affords one of the best examples of the immense benefit mankind may derive from the most abstruse scientific researches.

Metchnikoff was born at Ivanovka near Kharkoff in 1845. His father was an officer in the Imperial Guard, and his mother was of

Jewish origin. Educated at the high school and afterwards at the University of Kharkoff, he was early attracted to Zoology and published papers on *Vorticella* and on the nematode worm *Diplogaster* at the age of eighteen. In 1864 Metchnikoff went to Germany to continue his researches in the laboratories of von Siebold and Leuckart in Giessen and in Göttingen. At this time he discovered the alternation of hermaphrodite and bisexual generations in the nematode *Rhabdonema nigrovenosa*, a common parasite of the frog's lung, and showed that the hermaphrodite in the frog gives rise viviparously to a generation of free-living males and females the fertilised eggs of which infect a new host. Dissatisfied with his treatment by Leuckart, Metchnikoff proceeded to Naples and then to Odessa, where he met the famous Russian embryologist Kowalevsky, and in 1877 was made Professor in the University. It was during these years that a series of papers appeared on Rotifers, Gastrotricha and allied forms, and on the Siphonophora. Especially remarkable were Metchnikoff's contributions to embryology. He described the viviparous reproduction of the fly *Cecidomyia*, the metamorphosis of the *Actinotrocha* larva into the adult *Phoronis*, and of the *Tornaria* larva into *Balanoglossus*, determined the Chaetopod affinities of the parasitic *Myzostoma*, and discovered the embryonic membranes of Insects. A great deal of attention was devoted to tracing the development of the germ-layers in various Arthropods, Molluscs, Echinoderms, and Tunicates, and he was the first to determine correctly the fate of the ciliated and granular cells in the amphiblastula of Sponges.

The great value and originality of these researches have, however, been somewhat overshadowed by the later work of Metchnikoff which grew out of them. While studying minute transparent aquatic forms and larvæ, he was struck with the importance of the freely-moving mesoblastic cells found wandering throughout the spaces and tissues of the body. Combining the scattered observations of others with the results of his own patient researches, he concluded that these free amœboid cells, whether working their way through the tissues or floating in the blood and lymph as white corpuscles, are active scavengers which singly or in groups eat up and destroy decaying cells, foreign intrusive substances, and invading organisms, such as bacteria and other parasites. Just as an amœba injects its food, so these wandering cells or phagocytes, as Metchnikoff called them, take in useless or injurious living or dead particles in multicellular animals. To pursue his work on phagocytosis he left Odessa, and went to Paris in 1888, where he was welcomed by Pasteur. The great Frenchman had proved that parasitic bacteria are the cause of most infectious diseases, and that inoculations with artificial cultures of the offending organism may serve to prevent or to cure the disease. It remained for Metchnikoff to explain how immunity and recovery are brought about. In a masterly book on Inflammation (1892) he traced the phagocytic action of cells

throughout the animal kingdom from the Protozoa to man; and in a later work on Immunity (1901) he gave a complete exposition of his theories of the means of defence of animals against infective agents, reviewing all the modern work on natural and acquired immunity and on toxins and antitoxins. It was not without a struggle that Metchnikoff established his views; but they are now generally accepted, and form the basis of most of the new developments in the pathology of infectious diseases.

Metchnikoff's first wife died early, and in 1875 he married Olga Beloragitoff, a highly gifted lady, not only an accomplished linguist and artist, but also a zoologist of distinction. To the last Metchnikoff pursued his studies with untiring energy at the Pasteur Institute in Paris, of which he had become Professor and Sub-director. In his later days he turned his attention to the prolongation of human life by the control of the putrefactive processes in the intestine. Though he cannot be said to have successfully solved the difficult problems he then attacked, yet the new light he threw on the subject may enable others to advance further along the path he so boldly opened out. [E. S. G.]

The practical retirement of Professor DANIEL OLIVER, LL.D., F.R.S., from active botanic work at the age of sixty, has restricted the number in this Society to whom the news of his death, at the advanced age of 86, has come with a pang of regret, though this diminished band will ever recall the late professor as an example of strenuous and accurate work, and as adding greatly to the influence of Kew under the directorship of the Hookers.

DANIEL OLIVER was born at Newcastle-on-Tyne, on the 6th February, 1830, and his father and grandfather bearing the same christian name, he was styled "tertius" in his earlier papers. He was educated at the Friends' School, Wigton, and there showed a marked interest in field natural history, and a wider scope was afforded him on his joining the Tyneside Naturalists' Field Club (now the Natural History Society of Northumberland and Durham), where he came into contact with the naturalists Albany & John Hancock, J. Alder, Sir W. C. Trevelyan, and H. Tuke Mennell. Later he lectured on Botany at the Medical School of the University of Durham, an early initiation into his after-life work. His first printed paper came out in the 'Phytologist' under the editorship of Edward Newman, a modest contribution of less than a page, "List of a few plants found in Bouldersdale and Teesdale, together with the Formations on which they were found," *op. cit.* ii. (1847) p. 986, which gives an early intimation of ecology, a department which has so greatly developed in our days. Three successive short articles followed in the same medium, "Note on *Serratula tinctoria*, *Alsine stricta*, and a species of *Woodsia*," iii. (1850) p. 775, and "Notes of a botanical ramble in Ireland last autumn," iv. (1851) pp. 125-128. He says in the last paper, "I have already recorded *Spergula subulata*, *Naias flexilis*, and one or two [other plants]. It is very likely that the *Naias* may be found

by careful search in other parts of Galway; the scraps which I obtained were in a small lake not very far from the village [of Roundstone], I quite think floating, or perhaps detached, at the time of my collecting them; but unfortunately they were put away without either sufficient examination or consideration; it does so happen that we are at times unaccountably deficient even in ordinary observation" (*ib.* p. 127). In the same volume also appeared "Botanical notes of a week in Ireland during the present month (August, 1852), by Daniel Oliver, Jun., Esq., F.B.S.E." The signature calls attention to the fact that he had lost his grandfather, and had become a Fellow of the Botanical Society of Edinburgh (in 1851); on the second page (677) is a paragraph on *Najas flexilis*.

The next year he was elected into the Linnean Society, on the 1st February, 1853; he was proposed by Edward Newman, George Stacey Gibson, and J. S. Bowerbank. Mr. Allan A. Black became the assistant to Sir W. J. Hooker in charge of the Herbarium in the same year, to whom Oliver succeeded in due course.

In February, 1858, Oliver came to London, on the invitation of Sir W. J. Hooker, to help in the Herbarium, for which a small grant had recently been made; part of his early duties were to prepare Spruce's collections for distribution.

Dr. Lindley's health having become unsatisfactory, he resigned his chair of Botany in University College, Gower Street, in 1861; he was succeeded by Daniel Oliver, who held it until 1888. In order to avoid trenching upon his official work at Kew, Oliver lectured at 8 a.m. from the first week in May till the middle of July; this was effected by a local constable being employed to knock at his bedroom window at the early hour required for the professor's drive to Gower Street.

He was elected F.R.S. in 1863, and in 1864 became Keeper of the Herbarium and Library at Kew, which post he held until his retirement in 1890.

Dr. W. Botting Hemsley, F.R.S., who was very closely associated with Oliver for a long series of years, has most happily described the professor's methods. He says: "During this period he worked with untiring zeal on the constant influx of collections from all parts of the world, and set an example of punctuality and conscientious devotion to duty that has not failed to produce good fruit. Indeed, it was the discharge of his duties that prevented him during later years from continuing the valuable contributions to scientific literature, which had procured him a distinguished position among botanists of all countries. He studied all branches of botany, but his fame will rest on his unrivalled knowledge of flowering plants. This vast store of knowledge has always been open to all who chose to consult him, and its direct influence on the writings of others is only known to the few intimately connected with his official life. Probably no one man ever knew so much as he of those aberrant types which puzzle the most experienced botanists" (*Journ. Kew Guild*, 1898).

Already in 1859 Oliver planned and carried out courses of lectures to the young gardeners at Kew, which he continued till 1874, when a government grant was obtained for the work on a widened plan. He revised the Garden Guide, first written by Sir W. J. Hooker, from its 22nd edition in 1863 to its second issue of the 29th edition, virtually the 30th, in 1885; he initiated the Museum Guide in 1861, on to the 6th edition in 1875, the last three in conjunction with J. R. Jackson.

Another supplementary task which engaged Oliver's attention during 1858-9, was the arrangement of the British Herbarium belonging to the Linnean Society. In his diary George Bentham records on the 16th April, 1858: "remained in town on a committee with C. C. Babington and Dr. Alexander [afterwards Prior] for superintending the formation of a British herbarium; spent the morning with them routing out the old bundles in the Society's stores." On the 14th May: "After breakfast to the Linnean Society till two, with Dr. Alexander and Mr. Oliver commenced the selection of the specimens for the British herbarium of the Society." On the completion of his task, Oliver read a short note on the 15th December, 1859, giving an account of the work, which came out in our *Journal*, Botany, iv. (1860) pp. 194-198. Mention is made there of the "Marks suggested by Joseph Woods in his 'Tourist's Flora' are made use of to indicate in the 'Catalogue' the more or less perfect state of the specimens representing each species respectively." The fifth edition of the 'London Catalogue' is that referred to, and the copy in the herbarium is a testimony to care bestowed upon the work done by the reporter on that herbarium.

The period following Oliver's settlement at Kew, especially the years succeeding his appointment as Keeper, seem to mark the full flood time of productive energy in the establishment. Sir J. D. Hooker was working, so far as his official duties permitted, on the 'Genera Plantarum' with Bentham, whose time was given up to that work and the 'Flora Australiensis'; the 'Botanical Magazine' was conducted by the Director, and Oliver began the 'Flora of Tropical Africa.' Many smaller works absorbed the energies of the staff, such as the Botany of the Speke and Grant Expedition, which filled the 29th volume of the Linnean Society's Transactions, in 3 parts, issued in 1872-5, and numerous shorter papers, all testifying to the high pressure under which work was done in the great establishment of Kew.

Mr. James Britten, who knew Oliver well, and had exceptional opportunities of knowing the private and unofficial side of his chief, in a recent number of the 'Journal of Botany,' iv. (1917) p. 91, refers to Oliver as a lecturer, at the early hour already mentioned:—"I do not think he was an ideal lecturer: his manner was somewhat jerky and abrupt, and was not such as to encourage questioners—indeed, I do not remember that such a one ever presented himself." . . . "Daniel Hanbury came in connection with his important researches into the history of drugs, which took ultimate

shape in 'Pharmacographia'; he was one of the comparatively few visitors whom Oliver seemed glad to see, for the latter was impatient of interruption, and inquirers in search of casual information found short shrift at his hand. . . . Of course to genuine workers Oliver was always attentive enough, but his rapid speech and jerky manner certainly tended to intimidate the nervous, and, until I became used to them, alarmed me a good deal. I never knew a man who seemed so continually at high pressure; to meet him walking, always at a rapid pace, through the Gardens, or to hear him running up or down stairs, was in itself an object-lesson on the importance of time and the necessity of making use of every fragment of it.

"This, however, was during his working hours; it was not long before I was invited to spend an evening at his house—an invitation from time to time renewed and always gladly accepted—and I then had the opportunity of appreciating the restful and artistic side of Oliver's character. Ruskin was at the height of his reputation and the English Pre-Raphaelites were in vogue. Oliver was a devoted admirer of Ruskin, whose personal acquaintance was to come later.

"It was in 1869 that Oliver began to devote his leisure to drawing—to the pursuit of which his later years were mainly devoted. . . . His holidays were spent in sketching—first in North Wales, then in Cornwall, Jersey, France. . . . He had a small but choice collection of water-colours, mainly the work of Alfred W. Hunt, of which he had a high appreciation; to this he devoted the fees received from his lectures. . . .

"In the summer of 1874 Oliver invited me to join him at Auxerre, in the Department of the Yonne. It was the first time I had been abroad, and the memory of the fortnight then spent will always remain among the pleasantest of my life. Oliver devoted himself to sketching with characteristic energy, going out before breakfast, and working all day. The poplar-clad banks of the Yonne afforded abundant occupation, varied with studies of the architecture of the charming old town, especially of the cathedral, which from various aspects formed a centre of interest. . . . It was at this time that Oliver was copying the architectural treatment of plants and animals, some of which he subsequently reproduced decades (in 1882-6) for private circulation under the title 'Plant and Animal Forms as used by Workmen of the Middle Ages in Decoration chiefly of French Churches.' Of these there were five fascicles, the drawings principally from Amiens, Laon, Soissons, Beauvais, Senlis, and Noyon. The last fascicle is entirely devoted to Chartres . . . especially rich in floral representation: *Ranunculus repens*, sometimes vigorously treated, is a favourite subject, and there are fine studies of oak and ivy.

"Ruskin . . . wrote 'Quite the best I have ever seen. . . . Your Amiens work is magnificent and skilful and truthful—to the nearly highest point.' . . . As appears from various passages in Ruskin's writings, he was accustomed to apply to Oliver for

botanical information." Oliver owed to the writer of the present lines that he could not keep Ruskin on the straight track, witness his proposed genus "*Lucya*" for *Gentiana*, "after a king who by no means deserved that honour."

It was only during the last ten years of Oliver's Keepership that the present writer came into intimate relationship with the Professor, especially when the work afterwards termed 'Index Kewensis' was begun. At the very outset Oliver begged me to make use of him in every way conducive to the furtherance of our aims, and during the remainder of his official life his help was continuous and unstinted.

Shortly after attaining the age of 60 he retired from office, but continued to live at Kew, and until the end of 1895 acted as editor of Hooker's 'Icones.' In 1891 the University of Aberdeen conferred on him the honorary degree of LL.D.; previously in 1882 the Edinburgh Botanical Society had chosen him as one of its six Honorary Fellows. Other honours were: in 1884, one of the Royal Medals of the Royal Society, and in May, 1893, the Gold Medal of the Linnean Society.

He rarely suffered from ill-health, and even when afflicted by a bad cold, and wearing a skull-cap in the Herbarium in consequence, he resented enquiries as to his health. His death on the 21st December, 1916, after a few days' illness, was swift and peaceful. He was buried at Isleworth, in the Friends' burial-ground attached to the Meeting House, which he had regularly attended since he came to Kew.

It was the writer's intention to draw up a bibliography of Oliver's writings, but a nearly complete list having been printed in the Kew 'Bulletin of Miscellaneous Information' for 1917, pp. 32-36, it seems needless; the only omissions we have noted are two early papers in the 'Phytologist' set out above, and the "Plant and Animal Forms" described by Mr. Britten, which we have quoted from the 'Journal of Botany,' April 1917.

There is a portrait by J. W. Forster in the Herbarium, Kew, and several photographs at various periods of his life, extant; the last taken of him showed him in July 1916 as one of a group of four Keepers, his associates being Mr. J. G. Baker, Dr. W. Botting Hemsley, and the present holder of the office, Dr. Otto Stapf.

A compliment our late Father of the Society greatly valued was: when he retired from official work, he contemplated withdrawing from the Society, but the Council unanimously decided to retain his name on our list, as of one whose contributions had greatly added to the importance of our publications, whose counsels had been of value, and his labours of signal worth, to the community of naturalists. [B. D. J.]

HENRY HAROLD WELCH PEARSON.—The death of Professor Pearson on November 3, 1916, at the age of forty-six, deprived Botanical science of one of its most active and useful representatives. His original contributions, which covered a wide field,

were marked by thoroughness, breadth of view, and originality, but through his attractive and compelling personality, and his boundless energy, he was able to do much more for the advancement of learning and for the promotion of the scientific spirit than can be measured by the amount of his published work. Pearson had to a large extent his own way to make, and it was his determination and power of concentrated effort that enabled him to carve out his career and to achieve conspicuous success in several branches of botany.

Harold Pearson was born at Long Sutton, Lincolnshire, in 1870. He received the first part of his education in his father's school at Wickhambrook, in Suffolk, and was for a short time a boarder at a school at Beccles. On leaving school he became assistant to a chemist at Hawkhurst, but having another aim in view he devoted his leisure to preparing himself for the London University Matriculation examination, and after passing this examination he obtained an assistant mastership at Mr. Waite's school, St. Aubyn's, at Eastbourne. It was at Eastbourne in 1892 that I first met Pearson as a student attending a course of lectures which I was delivering as a University Extension Lecturer, and from that time onwards it was my privilege to keep in close touch with him. In the following year he obtained a Clothworkers' Exhibition, and with the additional assistance generously given by the Rev. Herbert Alston, who was then Rector of Little Bradley, in Suffolk, he was able to realize his ambition of entering the University with a view to proceeding to a degree in Natural Science. For the first three years of his Cambridge life Pearson was a non-collegiate student; in 1895 he became a member of Christ's College, of which he was elected a Foundation Scholar. He obtained a First Class in both parts of the Natural Sciences Tripos; in 1898 he was elected to a Frank Smart Studentship, and, in accordance with the regulations governing the Studentship, he migrated to Gonville and Caius College. In 1896 he went to Ceylon, and for the work he accomplished there he subsequently obtained the Walsingham Medal. In 1898 he was appointed Assistant Curator of the Cambridge Herbarium, and in the following year he became a member of the staff at the Royal Gardens, Kew, where he remained until his appointment as the first Harry Bolus Professor at the South African College, Cape Town, in 1903, a post which he held at the time of his death. In 1907 he took the Cambridge Sc.D. degree, and in 1916 was elected a Fellow of the Royal Society. Before leaving England Pearson married the youngest daughter of the late William Pratt, of Little Bradley, Suffolk, who has recently been appointed Warden of a Hostel, which has been founded as a memorial to her husband, for lady gardeners and botanical students at the National Gardens.

Pearson's contributions to botany range over several branches of the subject: his first published paper deals with the anatomy of the seedling of the Queensland Cycad *Bowenia spectabilis*; and in later years, by his own observations in the field and with the

assistance of co-workers, he added considerably to our knowledge of the South African Cycads, particularly as regards the evidence in favour of insect-pollination. The Cycad plantation in the Kirstenbosch Garden, which includes about 500 specimens, was arranged and in part planted with his own hands by Prof. Pearson, and it was on a slope facing his favourite plants that he was buried. His field-work in Ceylon led to two important papers, the second in collaboration with his friend J. Parkin, both of which were published in the Journal of the Linnean Society. Considering the short time at his disposal and his inexperience as an investigator, the success with which Pearson attacked the difficult problems connected with the question of the development of the Patanas is remarkable. This apprenticeship to field-work on a large scale was invaluable to him in later years, when he had many opportunities of studying the diverse floras met with in his African expeditions. His output from Kew consisted chiefly of descriptive systematic work, but he also found time to write an interesting account of some species of *Dischidia*, dealing chiefly with the morphology of the double pitchers: this paper was published in the Journal of the Linnean Society in 1901. He also rendered much assistance to Mr. Hemsley in the preparation of a comprehensive account of the Flora of Tibet. Pearson's most important work was on *Welwitschia* and *Gnetum*. In 1904 he paid his first visit to German South-West Africa, and collected material of *Welwitschia* which enabled him to amplify and extend Sir Joseph Hooker's classic memoir on that genus in a paper published in the 'Philosophical Transactions,' 1906. He visited the German Territory three times, and in January, 1916, he was at Windhuk at the headquarters of the Union Forces after the country had been conquered by General Botha's Army. A second expedition to Damaraland in 1906-7 enabled him to fill in many gaps in his first paper on *Welwitschia*, and in a later contribution (1909), also published by the Royal Society, he devoted special attention to the morphological nature of the tissue in the embryo-sac. During an expedition in 1908-9 financed by the Percy Sladen Trustees, to whom he was indebted for assistance on several occasions, he collected material of *Gnetum africanum* in Angola, of which he made the fullest use, both by his own researches and by generously sharing the spoil with other botanists. Pearson's critical investigations on the Gnetales have thrown much new light on the inter-relationships of the genera and of the Gnetales with the Angiosperms; they are characterized by clearness of reasoning and originality, and contain new morphological conceptions.

Pearson was an exceptionally good explorer; he was much more than a successful collector and practised systematist; he planned his expeditions on broad lines and had always in view the collection of evidence which might throw light on the events which led to the development of the South African floras. Though by the discovery of numerous new types and by his systematic papers

he did much to extend our knowledge of South African floras, had he lived longer he would undoubtedly have produced a work of first-rate importance, giving the results of his observations in many regions and his considered conclusions on phytogeographical problems. In addition to several papers dealing with the results of his expeditions, published in the 'Annals of the South African Museum,' Pearson contributed an admirably written account of his travels in South-West Africa to the 'Geographical Journal' (1910), and shorter sketches were published in the 'Gardeners' Chronicle' (1909), 'Nature' (1909) and elsewhere. Pearson made a few excursions into applied Botany, and his paper on the Witchweed (*Striga lutea*) admirably illustrates the value of a thorough acquaintance with pure Botany as a qualification for grappling with questions of Agricultural importance. During an enforced halt in Namaqualand he devoted himself to the investigation of certain physiological phenomena, and recorded his results in a paper published in the 'Annals of Botany' (1914) on the internal temperatures of *Euphorbia virosa* and *Aloë dichotoma*.

The history of his connection with the foundation of the National Botanic Garden is too long to record in full. In a Presidential address to the Botanical Section of the South African Association for the Advancement of Science (1910) he stated the case for the establishment of a National Garden with admirable wisdom and foresight, and urged the importance of adding to the Garden a National Herbarium, a Museum of Economic Botany, a Library, and Research Laboratories. After overcoming many difficulties his persistence was rewarded by the unanimous decision of the House of Assembly, on May 6, 1913, to establish a State Garden on the Kirstenbosch estate on the eastern slope of Table Mountain. Pearson was elected Honorary Director, and his time was thenceforth divided between the Garden and the South African College, a double responsibility which tasked his strength to the utmost. As the author of an article in 'The Cape' wrote—"The best memorial that can be raised to him is to see that his work at Kirstenbosch is carried on, and the National Botanic Gardens made what he pictured them in his mind's eye. That is the way to perpetuate his memory, for, as long as Kirstenbosch exists, there will be linked with it the name of its founder—the scholar and gentleman, Harold Pearson."

Pearson accomplished much in a short life, a life of unselfish devotion to Science and to the service of the State: he was a delightful companion, full of human sympathy and blessed with a keen sense of humour. One of his favourite authors was Charles Lamb, whose Essays and generally a volume of Shakespeare's plays were his companions on many journeys. He was in an exceptional degree a man who inspired respect and affection: in the words of one of his old students, "He was the very best head of a department that I have ever worked for, the most tolerant and the broadest minded; it was a real pleasure to act as his subordinate."

[A. C. SEWARD.]

CLEMENT REID occupied a unique position in relation to geology and botany. Commencing his career as a geologist, he soon turned his attention to the investigation of the history of the existing British flora as shown in the more recent geological formations, both by the actual plant-remains and by the evidence of alterations in the climatic conditions and physical features of the country. By his energetic and painstaking researches in this field, pursued unremittingly through a period of thirty-six years, he did more than any other man, with the exception of Watson (who approached the subject from a different standpoint), to elucidate the origin of our present flora.

He was born on the 6th January, 1853, the son of Edward Ker Reid, a London goldsmith. On his mother's side he was the grand-nephew of Michael Faraday, and it was no doubt the scientific atmosphere in the family created by the genius of Faraday which gave the experimental and critical bent to Reid's mind that fitted him for the work of his life. We learn from Mrs. Reid that it was from his mother that he inherited his great love of nature. As a child a partial deafness, the after-result of scarlet fever, cut him off from intercourse with other children, and threw him to a great extent on his own resources. This no doubt led to the enjoyment of solitary walks in the country, and to those habits of observation and deduction which qualified him in after years to take so high a rank as a naturalist.

He left school at the comparatively early age of fourteen, and his first start in life was to enter a publisher's office. He did not take kindly to the routine of office work, which was little suited to his active mind, but the business training helped him considerably in after years in dealing methodically with the vast mass of facts and specimens with which he had to do.

Seven years later he found a congenial occupation. Hearing through his friend Mr. H. B. Woodward of the likelihood of a vacancy on the Geological Survey, he qualified for, and in 1874 obtained the appointment. An ideal profession for the naturalist, it afforded him exceptional opportunities for the particular line of work to which he was attracted. In the first place he was stationed in the south-west of England, but, during the thirty-nine years of his connection with the Survey, his duties involved the geological exploration of a considerable portion of England, especially in the south. His friend and former colleague Mr. E. T. Newton, in an appreciative notice in the 'Geological Magazine' for January, 1917, tells us that he worked in Norfolk, Yorkshire, Lincolnshire, Sussex, Hampshire, the Isle of Wight, Dorset, Wilts and Cornwall, as well as in the London area. He was responsible for a number of the publications of the Survey. Mr. Newton, referring especially to the geological side of his work, remarks, "Whatever Mr. Reid undertook to do he did thoroughly. He was always a most careful and untiring worker, and even his times of relaxation were devoted to some collateral aspect of his work."

It was in 1876, when he was transferred to Norfolk, that his important botanical work was begun in connection with the exploration of the Cromer Forest-Bed with its wealth of vegetable remains. He depended in the first place on others for the identification of his specimens, but soon commenced to work them out for himself. In consulting the public collections, he was met by the difficulty that with many species ripe fruit and seeds which he most required to see were lacking. To remedy this, with characteristic energy, he set himself to form a collection of the fruits and seeds of British and Scandinavian plants likely to be required for comparison with the fossils, and in this way obtained a much more extended acquaintance with our flora, and an exceptional knowledge of the fruiting condition of plants. In his first paper on the Cromer deposits, only two plants were mentioned, but a little later in his "Geology of the Country around Cromer" he enumerated thirty-eight, and in subsequent papers the number was brought up to fifty-five.

In 1888, in conjunction with Mr. H. N. Ridley, he gave an account of the "Fossil Arctic plants from the lacustrine deposit at Hoxne," and the same year contributed his first general paper on the fossil flora of this country, entitled "Notes on the Geological History of the Recent Flora of Britain," in which 120 species were referred to. This was followed in quick succession by a number of papers dealing with the species found in various plant-deposits and of the climatic changes of which they gave evidence, especially as regards the occurrence of an inter-glacial period when the climate was mild, as shown by the presence of plants which could not have borne extreme cold. This theory he considered as conclusively proved.

A particularly interesting little paper was produced in 1892, "On the natural history of isolated ponds." In this he dealt with problems of distribution and the causes of plant-dispersal which always fascinated him.

In 1897 he married Miss Eleanor Mary Wynne-Edwards, and it was with that lady's able assistance and co-operation that most of his subsequent work at fossil plants was accomplished. As the field of investigation extended it became necessary not only to be acquainted with the plants of Northern and Western Europe, but practically with those of the world, for in some deposits startling results were obtained, remains of plants being found which now only occur in distant parts of the globe. In this direction Mrs. Reid was particularly helpful, working for a long time at Kew examining and making drawings of fruits, seeds, etc., to supplement the collection already accumulated.

In 1898 Reid described *Limnocarpus*, a new (fossil) genus, and published a paper on "Further contributions to the Geological History of the British Flora," enumerating 240 species.

In 1899 his book 'The Origin of the British Flora' appeared, embodying the results of the author's many years of careful and patient research, dealing with the means of dispersal of plants and

the changes of the geography and climate of this part of Europe, and giving a systematic account of the history of our present flora as indicated by the geological evidence. Though but a thin volume of less than 200 pages, this represented a very important addition to the literature of British botany.

In 1902 he contributed the article "Palæo-botany Tertiary" to the *Encyclopædia Britannica*.

In 1905 a visit to Tegelen in Holland, where some particularly interesting plant-remains had been found, opened up a new field of work, and in conjunction with Mrs. Reid three memoirs were produced dealing with this deposit, from which a number of Eastern Asiatic types were identified. A little later there were papers by Mr. and Mrs. Reid on the Pre-Glacial Flora of Britain, and on the Lignite of Bovey-Tracey. In 1908 Reid went out to Cyprus on behalf of the Colonial Office to report on the water-supply.

In 1913, at the age of sixty, Reid retired from the Geological Survey and went to live at Milford-on-Sea, on the coast of Hampshire, where he had purchased an acre of land in a beautiful little valley and built himself a house which he called "One Acre." It was an ideal situation, quite close to the geologically-famed Hordle Cliffs, with their fine exposure of the Lower Headon beds, rich in plant-remains. His garden contained many plants of interest, especially those of genera found as fossils.

During the too brief period of his rest from official duties he published, among other works, his small book 'Submerged Forests,' a paper on the plants of the late Glacial deposits of the Lea Valley, and jointly with Mrs. Reid a paper on a new fossil *Corema*, and a magnificent large-quarto monograph on the Pliocene Floras of the Dutch-Prussian Border, in which 189 species were enumerated, many of them new, and in a number of cases having their nearest living representatives in the Himalayas, China and Japan. This and several of the other joint works were illustrated by numerous micro-photographs taken by Reid, who was particularly successful in their production. In conjunction with the present writer, he entered upon the investigation of the fossil Characeæ, obtaining some important results in connection with those from the Middle Purbeck beds, a preliminary report upon which appeared in the 'Proceedings' of the Royal Society. We were engaged on a paper on the Chara-remains of the Hordle Cliffs at the time of his death. For many years he had suffered from acute attacks of indigestion, latterly his heart became affected, and on the 10th December, 1916, he passed away. He was buried in Milford churchyard.

He became a Fellow of the Society on 6th December, 1888, and his cheery, genial personality was a familiar one at its meetings for many years. He served on the Council in 1900-2 and 1905-7. In 1875 he was elected F.G.S., and was appointed a Vice-President of that Society in 1913. He was elected to the Royal Society in 1899.

He was an enthusiastic naturalist and a man of extraordinary energy. A few only of his writings on palæo-botany have been referred to here, but some idea of his intellectual activity may be gathered from the fact that the published notes, papers, and books, either written by himself, or to which he made important contributions, total up to considerably over a hundred, many of them representing an enormous amount of carefully worked-out detail. He was wonderfully ingenious and resourceful in devising means for coping with the difficulties which beset the palæontologist.

He was extremely modest as regards his own attainments and was one of the kindest of men, always thoughtful and considerate for others, always public-spirited and with a large outlook on life.

An excellent portrait by Messrs. Elliott & Fry was reproduced in the 'Journal of Botany' for June, 1917, in conjunction with a short account of his life. [JAMES GROVES.]

SIR MARC ARMAND RUFFER, Kt., lost his life on the 27th April last, when returning from Greece to take up his duties in Egypt, by the sinking by enemy action of the 'Arcadian' in the Mediterranean.

He was born in Paris in 1859, the eldest son of the late Baron Alphonse Jacques de Ruffer, but received his education chiefly in England, at University College, London, and Brasenose College, Oxford, in 1888 becoming D.M. After working in Paris under Pasteur and Metchnikoff, he aided in establishing the British Institute of Preventive Medicine in 1893, and became its first Director: it is now the Lister Institute. In carrying out the first important work done in the new institution—the production of diphtheria antitoxin—he fell a victim to diphtheria and nearly died of it. This attack so enfeebled his system that he resigned his post, and went to Egypt to recuperate, and there he settled, becoming Professor of Pathology and Bacteriology in the Cairo Medical School. After serving on many enquiries and conferences, he was appointed President of the Sanitary, Maritime, and Quarantine Council of Egypt; he re-organised the work of the department, built special pilgrim stations, and brought the pilgrims themselves under proper medical supervision, so keeping many diseases from entering Egypt, and passing onward to Europe. His last task was a visit on behalf of the Red Cross to Greece, he being the head of that organisation in Egypt. He leaves behind him a reputation for knowledge, tact, and firmness which are attained by very few.

His connection with the Linnean Society dated from 7th May, 1891. [B. D. J.]

Captain GEOFFREY WATKINS SMITH.—By the death in action on July 10, 1916, of Captain Geoffrey W. Smith, we have lost one of the most brilliant of the younger generation of zoologists. He was born in 1881, the youngest son of the well-known Westminster magistrate, Mr. Horace Smith, and Mrs. Smith, of Ivy

Bank, Beckenham. Starting his school career at Temple Grove School, he went to Winchester College and afterwards to New College, Oxford, where he was given a scholarship in 1900. After taking his degree in Zoology, he devoted himself to research and to teaching, both in his college and in the Department of Comparative Anatomy in the University Museum. In 1907 he was elected Fellow and Lecturer of New College, and some years later became Tutor. When the war broke out he volunteered his services, joined the O.T.C., and soon obtained a commission in the Rifle Brigade. He was killed by a shell in a trench just captured from the Germans near Pozières in France.

Geoffrey Watkins Smith will be deeply regretted by all who knew him. His was a particularly charming personality. Of a most lovable character, of unfailing good humour and courtesy, he endeared himself to all those with whom he came into contact. His pupils and colleagues at Oxford were devoted to him no less than the men he led at the front. A man of wide interests and of a cheerful disposition, he thoroughly enjoyed the good things of life. Fond of all kinds of sport, he excelled especially in lawn tennis and golf. Smith delighted in good literature, whether English or foreign, prose or poetry, and himself was author of some delightful carols dedicated to "The lady who first told me about Christmas." Indeed, the literary style of his scientific writings adds much to their value. When a mere schoolboy he contributed notes on birds to the 'Zoologist' (1898), and since then has published a large number of original papers on various subjects ranging from the Protozoa to the Vertebrata. But he soon devoted his energies more especially to the Crustacea. It was not, however, in mere systematics or even in morphology that Geoffrey Smith was most interested, but rather in the wider problems of evolution and heredity as met with in the study of parasitism and sex. Having taken his degree he went to Naples in 1903, and worked on *Gnathia* and on high and low Dimorphism in the Tanaidæ (Mitth. Zool. Sta. Neapel, 1904). At the request of Prof. Dohrn he then undertook to write a monograph on the Rhizocephala. This monograph, one of the most interesting of the series, appeared in 1906, and contains many important contributions to our knowledge of the structure and life-history of these remarkable Crustacean parasites, and also of the strange effect on their Crab hosts named parasitic castration by Giard, who first detected it. It was the starting point for a series of "Studies in the experimental analysis of sex," published in the 'Quarterly Journal of Microsc. Science' up to 1914, which formed Smith's most important contribution to science. He showed that the maturing female crab undergoes profound changes in fat metabolism as the eggs are formed, and that the parasitic *Succulina* induces similar change in the male crab it infects—changes which are accompanied not only by the development of female secondary characters, but also of female primary sexual characters, if the parasite is got rid of and the crab recovers. The male crab in fact is converted

into an hermaphrodite, containing spermatozoa and ova. The female undergoes no such change. He argued that, since in many cases the secondary sexual characters develop independently of the ovary or testis, the assumption by the one sex of the characters of the other cannot be due to the secretion of a hormone by the gonad, but to some more profound change in the metabolism which may effect both primary and secondary characters. These observations he brought into harmony with Mendelian results by suggesting that the female Crustacean is homozygous and the male heterozygous to sex; thus the male would be a potential hermaphrodite. From his work on *Sacculina* he was led to the view that the sessile and parasitic Crustacea, owing to their peculiar mode of life, and the consequent alteration of their metabolism, are hermaphrodite and have all been derived from the male sex, and further that the so-called complementary males of the Cirripedes are in reality arrested protandric hermaphrodite individuals.

In 1907 Geoffrey Smith undertook a journey to Tasmania chiefly with the object of studying the strange fresh-water Crustacean *Anaspides*, recently discovered there by Mr. G. M. Thompson (Linn. Soc. Trans., ser. 2, Zool., vol. vi. 1894, p. 285). On this expedition, of which he gave a delightful account in a little book entitled 'A Naturalist in Tasmania,' he not only obtained *Anaspides*, but also a related but quite new genus *Paranaspides*. With the help of this material he was able to bring forward convincing evidence of the correctness of Dr. Calman's contention that the Anaspidæ are the remnant of a group found in the Carboniferous strata and worthy of being placed in a separate division, the Syncarida. He also collected other forms on his travels and published monographs on the land and fresh-water Crayfishes of Australia, in which the geographical distribution, habits, and inter-relationships of the species are discussed with his usual skill and originality (Proc. Zool. Soc. 1912 and 1913). His papers on "The Life Cycle of the Cladocera" (Proc. Royal Soc., 1915), and on "The Genus *Lernæodiscus*" (Journ. Linn. Soc., Zool., vol. xxxii. 1915, p. 429), may also be mentioned. Several of his works were written in conjunction with others, for he was always most successful in rousing in his friends and pupils the enthusiasm he felt so keenly himself. [E. S. G.]

The death of FREDERIC STRATTON on the 5th December, 1916, removes from the Society a Fellow elected 21st January, 1869, and to some of us a close and dear friend.

He was the son of William Stratton, of Newport, Isle of Wight, where he was born 16th November, 1840, and in that town he practised as a solicitor for 53 years, and 40 years as Clerk to the Board of Guardians, retiring in 1903.

It is as a local botanist that he was best known to this Society. The writer recalls his first meeting with Mr. and Mrs. Stratton at the little inn at the foot of Ben Lawers in August, 1870, and the ascent of that mountain the following day, and that pleasant

meeting was followed by many others in the course of the succeeding years. Mr. Stratton, by his energy and enthusiasm, was recognised as the centre of botanic work in the Isle of Wight. About 1880 he began a local flora in the pages of a Newport newspaper, saying that it would be the last local flora of 'the Island,' as Mr. Townsend's Hampshire flora would take the whole of the island in its scope. Nevertheless, at a later period, in 1900, he published a 20-page pamphlet, 'The Wild Flowers of the Isle of Wight.' His herbarium included his alpine collections; he delighted to get into Switzerland and to wander upon the mountains, and forget the tedium of office drudgery. His last contribution to the Isle of Wight botany was his "Flowering Plants and their allies" in Morey's 'Guide to the Natural History of the Isle of Wight,' 1909, forming pages 126-199, with 3 plates.

After some months of declining health, Mr. Stratton became seriously ill only a few days before his death, which took place during the night of Monday, 4th December, 1916, passing quietly away in his sleep; the cause was heart failure following influenza. He leaves a widow and a large circle of sons and daughters—eleven children were born to him—and the universal regret of a still wider circle of friends who will ever cherish the recollection of a most charming and loveable character. [B. D. J.]

[Since the Obituary Notice of Count Solms was printed in our 'Proceedings' last year, the following bibliography has become available, and is here given with corrections and amplification from that published by Dr. Jost.—*Gen. Sec.*]

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CAPELLINI, GIOVANNI, and COUNT SOLMS.

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SOLMS and GUSTAV STEINMANN.

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JAMES STIRTON, M.D., F.L.S.—On 14th January, 1917, died James Stirton, M.D., in his home in Glasgow, in the 84th year of his age. A native of the East of Scotland, and born in 1833, he attended classes in the University of Edinburgh, and showed great ability, especially in the mathematical classes. He took his medical curriculum in Edinburgh, gaining the highest place in several classes; and he continued his medical education at schools on the continent of Europe.

During the years 1856-58 he was Resident Mathematical Tutor at Merchiston School in Edinburgh, and proved himself to be a very successful teacher; but in 1858, taking the degree of M.D., he settled in Glasgow, where he built up a large medical practice. Appointed in 1876 a Lecturer on Gynæcology in the Royal Infirmary of Glasgow, he was in charge for a number of

years of the wards for diseases of women in the Infirmary. In 1889 he became Professor of Midwifery in St. Mungo's College, which post he held for fifteen years.

Dr. Stirton was keenly interested in the study of plants, devoting his attention particularly to Lichens and Mosses, of which he possessed exceptional knowledge, gained during many visits to their haunts and by careful study of their microscopic structure. He made many visits to the Scottish mountains, and discovered numerous previously undetected species in these expeditions. Ben Lawers was visited by him many times, rarely, if ever, without finding some novelty. Collections of these plants were sent to him by correspondents from Canada, South America, New Zealand, Australia, Tasmania, South Africa and elsewhere; and these yielded to his study many new and interesting species.

The results were made known in numerous papers and short notes communicated by him to scientific societies and journals. Among the societies were the Natural History Society of Glasgow, the Glasgow Field Naturalists' Society, the Philosophical Society of Glasgow, the Linnean Society of London, the Botanical Society of Edinburgh, the New Zealand Institute, and the Royal Society of Victoria, in Australia. Among periodical literature to which he sent papers may be mentioned 'Grevillea,' the 'Scottish Naturalist' and its successor, the 'Annals of Scottish Natural History.' To the Handbook 'On the Fauna and Flora of the West of Scotland,' prepared in 1876 for the meeting in Glasgow of the British Association, he contributed a general introduction "On the Cryptogamic Botany" and the lists of Lichens and Mosses.

In determining new species Dr. Stirton relied greatly among lichens on their reactions with I and K, and among mosses on the cellular structure of the leaves.

He was elected a Fellow of the Linnean Society on 2nd December, 1875; he was also a Corresponding Member of various European Societies. The esteem in which he was held by those who knew him best was shown by the terms of resolutions passed by the Societies in Glasgow in support of his candidature for the botanical chair in the University of Glasgow in 1868 and again in 1879, as well as by the testimony of those best qualified to speak of his scientific merits. The memory of his worth will not readily be lost by those who enjoyed his friendship.

List of Papers and Notes published by Dr. Stirton.

Exhibitions or reports of rare or new forms, at meetings of Glasgow Nat. Hist. Soc., mentioned in 'Proceedings' for years 1858-69, issued 1869 as Vol. i., see pages 112, 115-6, 126, 142-3, 145, 165, 197, 198, 199, 202-3, 225, 231, 238, 381; Vol. ii. 1869-75, 18, 33.

Exhibitions, etc., at meetings of Glasgow Field Nat. Soc., Vol. i. of 'Transactions,' issued 1873-7, pages 23, 28, 29, 34, 35, 37-8, 70, 72-3, 102, 104, 176.

New and rare Mosses from Ben Lawers, Perthshire (1870). Edinburgh Bot. Soc., Trans., x. 1870, 426-32, xi. 1873, 75-82. (A review of the mosses of the Ben Lawers range of hills.)

- Climate of Egypt and Nubia, etc. Glasgow, 1872.
- Additions to the Lichen Flora of New Zealand. Glasgow F. N. Soc., Trans., i. 1873, 15-23. (18 new species described, with notes on many others.)
- Additions to the Lichen Flora of Great Britain. "Grevillea," ii. 1873-4, 71. (6 species, all named by Nylander.)
- On *Solorina bispora*, Nyl. "Grev.," ii. 1873-4, 106-8. Reply to criticism by Rev. J. Crombie, followed by description of *Lecidea epiphorbia*, n. sp., a parasite on *Solorina*.
- Lichen from Ben Lawers (*Lecidea subretrusa*, Stirton). "Grev.," iii. 1874-5, 24-5.
- New British Lichens. "Grev.," iii. 1874-5, 33-7. Description of 13 species, from Dalwhinnie, Grantown, Ben Arthur, and Ben Lawers.
- New British Lichen. "Grev.," iii. 1874-5, 79. Description of *Parmelia Millaniana*, n. sp., followed by a note on *Arthonia lurida*, Ach.
- Parmelia Millaniana* (a rejoinder). "Grev.," iii. 1874-5, 173-4.
- Lichens, British and Foreign. Glasg. F. N. Soc., Trans., i. 1875-6, 85-95. Descriptions of numerous new species and varieties from Scotland (Ben Lawers, Pen-y-gloe, Blair Atholl, Altnaharra, and Thurso), Canada, Madeira, South Africa, Australia, and Tasmania.
- New and rare Lichens. "Scot. Nat.," iv. 1877-8, 27-9. Descriptions of 5 n. sps., and notes on others, from Argyllshire.
- Descriptions of some New Zealand Lichens collected by John Buchanan in the Province of Wellington (1874). N. Zeal. Inst., Trans., vi. 1874, 235-41.
- Enumeration of the Lichens collected by H. N. Moseley, Naturalist to H.M.S. 'Challenger,' in the islands of the Atlantic Ocean (1874). Linn. Soc. Journ. (Bot.), xiv. 1875, 366-75.
- Additions to the Lichen Flora of New Zealand (1874). Linn. Soc. Journ. (Bot.), xiv. 1875, 458-74.
- Description of a new Lichen, *Stereocaulon Buchananii* (1874). N. Zeal. Inst., Trans., vii. 1875, 367-8.
- Descriptions of recently discovered Foreign Lichens (1876). Glasg. Phil. Soc., Proc., x. 1877, 156-64.
- On new genera and species of Lichens from New Zealand (preceded by remarks on the influence of microscopic fungi). Glasg. Phil. Soc., Proc., x. 1877, 285-306.
- New or rare Lichens. "Scot. Nat.," iv. 1877-8, 27-9. Descriptions of 5 n. sps., and notes of others from Argyllshire.
- Descriptions of new Lichens. "Scot. Nat.," iv. 1877-8, 164-8. 5 n. sps. from Mull, 2 from Carve, and 1 from Aviemore.
- On certain Lichens belonging to the genus *Parmelia*. "Scot. Nat.," iv. 1877-8, 200-3, 252-4, 298-9. Descriptions of species, mostly new, from Queensland, New Zealand, South Africa, and Brazil, also of *P. reddenda*, n. sp., from New Galloway in Kirkcudbrightshire.
- A New Scottish Lichen. "Scot. Nat.," iv. 1877-8, 300. *Lithographa Andrewii*, n. sp., from New Galloway.
- Descriptions of new Scottish Lichens. "Scot. Nat.," v. 1879-80, 16-17. 3 n. sps. from the Breadalbane Mountains, 1 from Argyll, 1 from Arran.
- New and rare Scottish Lichens. "Scot. Nat.," v. 1879-80, 217-21. 7 n. sps. from Rannoch, 4 from Ben Lawers, 1 from Killin, 1 from Glas Meal in Forfarshire, 1 from Forbes, 1 from Argyll.
- Lichens growing on living leaves from the Amazons (Valley), (1874). Glasg. Phil. Soc., Proc., xi. 1879, 99-111.
- New and rare Lichens from India and the Himalayas. Glasg. Phil. Soc., Proc., xi. 1879, 306-22.

- Remarks on Mr. Crombie's Paper on the 'Challenger' Lichens in the Journal of the Linnean Society, xvi. (1877). Linn. Soc. Journ. (Bot.), xvii. 1880, 152-7.
- Additions to the Lichen Flora of Queensland (1880). Victoria Roy. Soc., Trans., xvii. 1882, 152-7.
- A new genus (*Trichocladia*) of Lichens (1881). Vict. R. S., Trans., xviii. 1882, 1-2.
- On Vegetable Parasites of the Tea Plant, more especially on that of Assam (1881). Glasg. Phil. Soc., Proc., xiii. 1882, 181-93.
- On the genus *Usnea*, and another (*Eumitria*) allied to it (1881). "Scot. Nat.," vi. 1881-2, 99-109, 292-7. Treats of lichens from Himalayas, Australia, and other regions not in Scotland chiefly; but includes 6 n. sps. from Scotland (New Galloway and Ben Lawers).
- On the genus *Usnea*, with descriptions of new species. "Scot. Nat.," N. Ser., i. 1883-4, 74-9. New lichens from India, Australia, South Africa, South America, North America, and one (*U. protensa*, n. sp.) from New Galloway.
- On Lichens, (1) from Newfoundland, collected by Mr. A. Gray, with a list of the species; (2) from New Zealand; (3) from the South of Scotland (1882). Edinburgh Bot. Soc., Trans., xiv. 1883, 355-62.
- Short notes in Glasg. N. H. Soc., Proc. 1883-6, pp. xxxiv, lxv; 1896-9, 291.
- Notes on British *Cladonia*. "Scot. Nat.," N. S., ii. 118-22. Description of *C. arborea*, n. sp., from near Dumfries, and of varieties of *C. subsquarrosa*, Nyl.
- On *Myurium Hebridarum* and other Mosses in the Hebrides. "Scot. Nat.," N. S., ii. 1885, 182-3.
- New Mosses from Scotland. "Scot. Nat.," N. S., ii. 1885-6, 283-5. Chiefly on *Campylopus* from Benbecula, and a few notes on *Grimmia* spp., from Mid Perth and Dumbartonshire.
- On certain Mosses of the genus *Dicranum*. "Scot. Nat.," N. S., ii. 1885-6, 254-8. Discusses and names various forms of *D. circinatum*, Wils., with a few other forms of *Dicranum* from Mid Perth, S. Aberdeen, W. Inverness, Argyll, and Dumbarton.
- New British Mosses. "Scot. Nat.," N. S., iii. 1887-8, 35-7. One from Ben Lawers, and one from Harris.
- A curious Lichen from Ben Lawers. (*Lophothelium acervatum*.) "Scot. Nat.," N. S., iii. 1887-8, 37-9.
- On some Scotch Mosses of the genus *Grimmia*. "Scot. Nat.," iv. 1889-90, 217-20. New species from Glen Ogle and Callander.
- New and rare Scottish Mosses. Ann. Scot. Nat. Hist., vi. 1897, 117-122. Descriptions of new species and notes on numerous other mosses from Mid Perth, Argyll, Dumbartonshire, Outer Hebrides, Orkney and Shetland.
- Lichens and Mosses from Carsaig, Argyll. Ann. S. N. H., viii. 1899, 41-5.
- On the Mosses of the genus *Campylopus*. Ann. S. N. H., viii. 1899, 103-6. Chiefly from Benbecula.
- New and rare Scottish Mosses. Ann. S. N. H., ix. 1900, 174-81. Descriptions based largely on structural features of leaves of mosses from Ayrshire, W. Perth, Mid Perth, Argyll, Outer Hebrides, Orkney and Shetland.
- Mosses from Tarbert, in Harris. Ann. S. N. H., x. 1901, 108-14. Chiefly relates to species of *Campylopus* and *Grimmia*.
- New and rare Scottish Mosses. Ann. S. N. H., xi. 1902, 103-11. Discusses structure of various species from Killin, Rannoch, "the Cobbler" in Argyll, Mull, Skye, Harris and Lewis.

- Some Scottish Mosses. Ann. S. N. H., xii. 1903, 109-15. 5 new species, in barren state, described, by leaf-structure, with notes on others, from Mid Perth, Outer Hebrides and Orkney.
- New and rare Scottish Mosses. Ann. S. N. H., xiv. 1905, 104-8. 4 n. sps. and 2 others described, and notes on others, from Lanarkshire, W. Inverness, Skye, and E. and W. Ross.
- Observations on some critical species of Scottish Mosses. Ann. S. N. H., xv. 1906, 106-13. Discusses species from Mid Perth, Forfarshire, Argyll, Dumbartonshire, and Orkney.
- West Highland Mosses and problems they suggest. Ann. S. N. H., xvi. 1907, 42-45. Relates to species from W. Inverness and Skye.
- New and rare Mosses from the West of Scotland. Ann. S. N. H., xvi. 1907, 171-80, and Glasg. Phil. Soc., Proc., 1907, 150-8. Relates to species from Arisaig, Fort William, Killin, and Glasgow.
- New and rare Mosses. Ann. S. N. H., xvii. 1908, 171-6. Descriptions of 6 new and other rare species of Mosses, mostly barren, from Linlithgowshire, Stirlingshire, Mid Perth, W. Inverness, Argyll, and Dumbartonshire.
- New and rare Mosses from the West of Scotland. Ann. S. N. H., xviii. 1909, 168-73. Relates to species from Kirkcudbrightshire, Renfrewshire, Mid Perth, Argyll, and Outer Hebrides.
- Leucobryum pumilum* in Britain. Scot. Bot. Rev., i. 1912, 48.
- Mosses from the Western Highlands. Scot. Bot. Rev., i. 1912, 89-94. Describes 4 n. sps., and records another from Gairloch, and one from near Loch Linnhe.
- [J. W. H. TRAIL.]

ALFRED WILBY TAIT (Baron de SOUTELLINHO) was born on October 25, 1847, at Candal, near Oporto, Portugal, and died on March 15, 1917, at Oporto. He was a British subject and educated in England. He carried on an export wine business under the name of Velloso & Tait, and throughout his busy career his favourite recreation was the study of botany and more especially floriculture. In the course of time he gathered together a most interesting collection of beautiful and rare plants from all parts of the world. Always most generous in giving specimens of these to his numerous friends and nursery gardeners, he has been called "O pae dos jardineiros," i.e. "a father to the gardeners." It was always a great pleasure to him to introduce and distribute a new plant either for its beauty or utility.

Among his numerous introductions here were the beautiful white Mashona lily (*Watsonia*), the Canary Island broom, *Cytisus proliferus*, Linn. f., a possible resource as food for cattle during drought, the almost seedless variety of the Japanese loquat (received from India), the long and beautiful Japanese *Wistaria* in several varieties, the lovely small *Camelia Sasanqua*, the sweet grape-fruit from North America, many varieties of grapes, some of Mr. Burbank's productions in improved plums, the Shasta daisy (*Chrysanthemum maximum*), and many other plants too numerous to mention.

He specialised in the *Narcissi* and *Iris*. On March 5, 1886, he discovered near Oporto a new *Narcissus* which the late Mr. Peter Barr named "*N. Johnstoni*," after Mr. Alfred Tait's friend, Mr. Edwin Johnston, a botanist who survived the Baron only a few weeks. It proved eventually to be a natural hybrid between

N. Pseudo-narcissus and *N. triandrus*, and therefore found only where these two species grow together. The rediscovery of *Narcissus cyclamineus* was an interesting event after having been lost for about 260 years. It appears to have been described and figured by Parkinson in 1640 in his "Theatrum" and reported to have been found in Spain; at that time Portugal was under the dominion of Spain. As, however, no one could find it in Spain, botanists had at last become sceptical as to whether such a species really existed, or whether it had not been an aberrant form of some other species. There was therefore joy among flower lovers when Mr. Edwin Johnston and the Baron found it fairly abundant in a few localities not far from Oporto.

Besides finding several hybrid *Narcissi* in several species the Baron artificially hybridized others, and thus produced some curious specimens. He corresponded for many years with Mr. Wolley Dod, Mr. Peter Barr, Professor Henriques of Coimbra, and other authorities on the *Narcissi*, and in 1886 he published for private circulation a pamphlet on the *Narcissi* of Portugal, in which this country is especially rich. On the Irises he kept up a diligent correspondence with the late Sir Michael Foster of Cambridge. Having received from my brother a blue *Iris* found on my property near Abrantes, Sir Michael described it as a new species in the 'Gardeners' Chronicle' of August 25th, 1906, under the name of *Iris Taiti*, after my brother. Another new species of *Iris* was discovered by my brother in the Gerez Mountains, the *Iris Boissieri*, so named by his old friend Dr. Julio Henriques, the distinguished Professor of Botany at Coimbra University. This was described in the 'Gardeners' Chronicle' of July 9, 1887, page 38. Still another new species found by my brother, the *Iris lisbonensis*, was described in the 'Gardeners' Chronicle' of June 6, 1910.

He was elected a Fellow of the Linnean Society on the 3rd March, 1887. [WM. C. TAIT.]

ROLAND TRIMEN (1840-1916).—Roland Trimen, the third son of Richard and Marianne Esther Trimen, was born October 29, 1840, at 3 Park Place Villas, Paddington. He was a clever boy and very early displayed a great love for natural history. His younger brother Henry was devoted to the same pursuits, and as collections increased, it was decided that Roland should take up entomology and Henry botany. Thus, early in life and almost accidentally, the special careers of the two distinguished naturalists were determined.

Roland was not physically strong, and was first sent to a private school at Rottingdean, entering in 1853 King's College School, where he remained for four or five years. After leaving school his health still remained weak, and, when about eighteen, he was advised to take a voyage to the Cape. The climate there seemed to suit him, and returning in 1860, he at once entered upon his thirty-five years in the Cape Civil Service.

In 1883 he married Miss Henrietta Blanche Bull, daughter of H. E. Boyes Bull, of Calcutta.

In 1873 he became, in succession to E. L. Layard, Curator of the South African Museum in Cape Town, a post he retained until 1895, when, resigning on account of his health, he returned to this country and lived here until his death at Epsom on July 25, 1916. In 1881 he was appointed sole Commissioner to the Phylloxera Congress at Bordeaux; in 1886 a member of the Commission for extirpating this pest from the Cape vineyards; in 1892 a member of the Cape Fisheries Commission.

He was elected a Fellow of the Royal Society in 1883, was President of the South African Philosophical Society 1883-84, and of the Entomological Society of London 1897-98. In 1899, during his residence at Oxford, the degree of Hon. M.A. was conferred upon him.

Roland Trimen's whole career was profoundly influenced by his friendship with Charles Darwin, whom he first saw in the Insect Room of the British Museum, towards the close of 1859, just after the appearance of 'The Origin of Species.' He had then no opportunity of speaking to the illustrious naturalist, but he heard Adam White solemnly protesting "Ah Sir! if ye had only stopped with the 'Voyage of the Beagle'!"

The 'Fertilisation of Orchids' was published in 1862, and Trimen was at once stimulated to study the Cape species in the light of Darwin's work, and to help the author in this and other directions—help acknowledged in later issues of the 'Fertilisation' (see 2nd ed., 6th impression 1899, pp. 40, 76-8). Darwin's letters* to him are, as Trimen has said, "an additional illustration of one of the most charming and attractive sides of Darwin's character—the gracious and glad welcome he never failed to extend to any one who even in the slightest degree endeavoured to render him aid in his researches"†. These investigations directly stimulated by Darwin, together with Trimen's classical work on Butterfly Mimicry published in 1869‡ (Linn. Trans. vol. xxvi. p. 497), led to the award of the Darwin medal by the Royal Society in 1910. He retained the greatest interest in this subject through all the increasing weakness and ill-health of his last years, and the present writer can never forget how, less than a month before Trimen's death, the story of recent discoveries in the geographical forms of *Papilio dardanus* (*merope*)—the most wonderful of all examples of mimicry, and first interpreted by him nearly half a century earlier, "restored for a moment his failing powers, and brought back his old enthusiasm"§.

* Darwin's correspondence with the South African naturalist is published in full in 'Charles Darwin and the Origin of Species,' Poulton, London, 1909, pp. 213-246.

† *Ibid.* p. 215.

‡ Often quoted as 1870, the year in which the *Volume* was published. Trimen's paper, read in 1868, is the first memoir in *Part III*, issued in 1869.

§ 'Nature,' vol. xcvi. 1916, p. 485-86.

Apart from Trimen's researches on subjects connected with evolution and natural selection, he was the author of the principal work on 'South-African Butterflies' (3 vols., London, 1887-1889). In writing this fine monograph, which may be looked upon as an expansion of his early work 'Rhopalocera Africæ Australis' (London, 1862-66), Trimen was assisted by Col. J. H. Bowker. Much literary grace is evident in all Trimen's writings, whether appearing as volumes or in the publications of the Linnean, Zoological, and Entomological Societies. He took great pains with his style, and felt a just pride in the clear and accurate descriptions which make his works so pleasant as well as so valuable to the reader.

Trimen had a keen sense of humour to which he gave free play in the companionship of kindred spirits. He delighted in the society of a large number of friends, for whom he felt and in whom he inspired a warm affection.

With Trimen's death the world has lost the last of the six great naturalists who laid the foundations of the study of Insect Mimicry—Charles Darwin, H. W. Bates, Fritz Müller, A. R. Wallace, Raphael Meldola, and Roland Trimen.

[E. B. POULTON.]

June 7th, 1917.

Sir DAVID PRAIN, C.M.G., F.R.S., President, in the Chair.

The Minutes of the Anniversary Meeting of the 24th May, 1917, were read and confirmed.

The report of the Donations received since the last meeting was laid before the Fellows, and the thanks of the Society to the several Donors were ordered.

Mr. John Kitching, Mr. Alfred James Wilmott, Mr. John Ramsbottom, M.A. (Cantab.), and Mr. Arthur John Fry Gibbons were admitted Fellows.

Mr. Harold Downes, M.B., Ch.M. (Edin.), Mr. Walter John Dowson, M.A. (Cantab.), and Mr. James Udale, were elected Fellows, and Mr. Albert Bruce Jackson was elected an Associate.

The President announced that he had appointed the following to be Vice-Presidents during the forthcoming Society's year :—Mr. JAMES GROVES, Mr. HORACE WOOLLASTON MONCKTON, Treas.L.S., F.G.S., Dr. DUKINFIELD HENRY SCOTT, F.R.S., and Dr. ARTHUR EVERETT SHIPLEY, F.R.S.

The Meeting then adjourned till 8.0 p.m. at the Lecture Theatre of the Civil Service Commission, Burlington Gardens.

Adjourned General Meeting,
June 7th, 1917, at 8.0 p.m.

The President, on taking the Chair, gave a succinct account, as follows, of the origin of the Hooker Lecture, which arose from a bequest of the late Sir JOSEPH DALTON HOOKER, G.C.S.I., C.B., F.R.S., augmented by a subscription of the Fellows, and a further contribution by Lady Hooker.

The late Sir Joseph Dalton Hooker, born on 30th June, 1817, died on 10th December, 1911, in his ninety-fifth year, was a Member of the Linnean Society for nearly seventy years. This is not the time to dwell upon the career and achievements of one of the most renowned of our Fellows and one of the most remarkable men who have directed their energies to the cultivation of the science of natural history. What concerns us now is that during his long Fellowship he was one of the wisest counsellors and truest well-wishers of this Society and that his kind thought of us was present to the last. By his will, Sir Joseph Hooker left £100, free of duty, as a legacy to the Linnean Society.

In January, 1913, the Council took into consideration the application of this bequest. Satisfied that the Fellows would not desire this legacy to be applied to the ordinary purposes of the Society, but would rather wish it to be used for some memorial of the illustrious donor in connection with the Society, the Council recommended, as most suitable, an adequately endowed Lecture on subjects especially associated with the name of Sir Joseph Hooker, to be delivered from time to time by distinguished men and to be published by the Society. The Council suggested that this generous bequest of £100 be treated as the nucleus of a Fund of not less than £600 to be raised for the purpose of carrying this proposal into effect. These recommendations were accepted by the Society.

The appropriateness of the proposal had already been made evident on 24th May, 1912, when a very eminent occupant of this chair chose as the subject of a singularly able Anniversary address, "The Relationship of Sir Joseph Hooker to the Study of Fossil Plants." Its suitability was again shown on 20th November, 1913, when a distinguished Fellow of this Society, who has followed the footsteps of our master in that region, delivered a lecture on "The Travels of Sir Joseph Hooker in the Sikkim Himalaya." Introducing the lecturer on that day, my immediate predecessor was able to inform the Society that £300 had already been invested as a fund for the purpose of founding the Hooker Memorial Lecture. The market value of that investment, it should be noted, was £180. To-day the value of the fund amounts to £385, and the Council entertain the hope that, with your aid, the balance of £215 required to fulfil the object defined in January, 1913, may be provided at no distant date.

While the Society has, thanks to the kindness of two of its Fellows, already listened to as many lectures on subjects especially associated with the name of Sir Joseph Hooker, neither of these has been a "Sir Joseph Hooker Memorial Lecture," owing to the fact that the scheme had not been originated at the time of the first lecture, and had not become matured when the second was delivered. It is, therefore, necessary to explain why, although the fund has not yet reached the minimum considered in January, 1913, to be necessary for the proper working of the scheme, our Society has decided that the first "Sir Joseph Hooker Memorial Lecture" under that scheme be delivered this session.

Three weeks hence we shall record the Centenary of the birth of Sir Joseph Hooker. It has been thought desirable, notwithstanding the incompleteness of the fund, to arrange that the first lecture under the scheme be delivered in 1917. Circumstances have rendered it impossible to arrange that the lecture be delivered on the actual birthday of the distinguished Fellow whose memory we are assembled to honour. But you may regard the date actually chosen by our Council as one that is not inappropriate. Sir Joseph Hooker was elected a Fellow of the Society on 7th June, 1842—this day three-quarters of a century ago.

The Society has been fortunate in being able to persuade the very distinguished successor of the father of Sir Joseph Hooker in the chair of Botany of the University in which Sir Joseph himself studied, to undertake the duty, and I now ask Professor Bower to deliver the "First Sir Joseph Hooker Memorial Lecture."

Professor F. O. BOWER, F.R.S., then delivered his Lecture on "The Natural Classification of Plants," illustrating his points by reference to the Filicales.

The President proposed a vote of thanks to the Lecturer, which was accorded by acclamation, and was briefly acknowledged by Prof. Bower.

A Cartographic Study of the Southern Element in the British Flora. (With 11 Maps, on Plates 1-5). By O. STAPF, F.R.S., F.L.S.

[Read 6th April, 1916.]

THREE years ago I published an analysis of the "Southern Element" in the British Flora*, supported by tables enumerating the species classed under that heading, and indicating their distribution in Great Britain and Ireland and also their northern limits on the Continent. It was obvious from the beginning that the addition of maps would greatly help in visualising the results obtained. However, there was no time then for preparing them. This has since been done, and the present paper is offered as an adaptation of the earlier essay to cartographic illustration. The introductory part of the paper has been taken over almost *verbatim*, whilst the tables and the paragraphs explaining them were eliminated. The remainder has been recast and connected with the maps. This, however, has not led to any modification of the conclusions arrived at originally. In fact, although the subject has been under the notice of British botanists for three years and I myself have constantly had my eye on it, no corrections of more than subordinate detail have been suggested. Only two of them need be mentioned. A revision of the British *Atropis* has convinced me of the identity of *A. festucaeformis* from Co. Down, Ireland, with *A. Foucaudii*, which therefore takes its place in the tables of my original paper as an Atlantic species. Material submitted by Mr. G. C. Druce has greatly assisted me in clearing up that point. The other detail is the elimination of *Allium triquetum* which I had put down as doubtfully indigenous, but consider now as an alien. This removes one of the Mediterranean elements. Neither of these corrections affects the cartographic illustrations, and only to a negligible degree the percentages and proportional figures.

The map used for the illustrations was designed for me on my instructions by Messrs. Sifton, Praed & Co. It combines Watson's "vice-counties" of Great Britain, as numbered in the last edition (1908) of the 'London Catalogue of British Plants,' and Præger's "divisions" of Ireland ('Irish Topographical Botany,' 1901). To show the distribution on the Continent an inset map of Europe was added. The procedure in construing the general maps (1-3) was this. The distribution of each species considered as "Southern" was entered in a separate map, then the number of species in each vice-county or division counted under the headings "Southern," "Atlantic," and "Mediterranean," and the percentages represented by them on the totals of "Southern," "Atlantic," and "Mediterranean" species computed. Finally,

* O. Stapf. "The Southern Element in the British Flora," Engler's Botanische Jahrbücher, Bd. 1. (Supplementband) pp. 509-525.

the vice-counties and divisions were classed into four groups according to these percentages, and the groups differentiated in the map by three degrees of shading and by blanks. Thus, black is used for 40 per cent. and upwards, hatched shading for 25-39 per cent., stippled shading for 12-24 per cent., blanks for less than 12 per cent. Similarly the black of the continental areas in maps 2 and 3 means that the area so marked contains 40 or more per cent. of the species of its class, the hatched shading stands for 25-39 per cent., and so on. Only in map 1 (Southern elements) was it found desirable to introduce a different value in the *inset* map, the percentages being 70, 40, and 15 respectively. It is, of course, understood that the term "Southern" is used throughout exclusively with reference to species indigenous in the British Isles, and therefore excludes species which might be "Southern" on the Continent, but do not occur in the British Isles. Finally, out of the insets of the area maps of the species making up the "Southern Element" a small number was chosen to illustrate the varying degrees of discontinuity of area which are represented by these species.

At the meeting of the British Association for the Advancement of Science at Portsmouth in 1911 a discussion took place on the relation of the present plant population of the British Isles to the Glacial period. It was opened by Mr. Clement Reid in an address in which he advocated the theory that no temperate flora could have survived the conditions prevailing in the islands during the Glacial period, that the existing flora, apart from a few arctic and alpine species, came in towards the end of, and after, that period, and that especially the "Atlantic or Lusitanian" plants (also referred to as "Pyrenean") and the "American" and "limestone" elements arrived and, may be, still arrive by chance introductions of seeds, now mainly due to birds driven by exceptional gales. I then expressed my agreement with the speaker's view as to the effect of the glaciation of the British Isles on the flora, and the reimmigration of the bulk of the latter in post-glacial times, but combated the supposition of the presence of the peculiar American, Atlantic, and limestone elements being due to chance introduction over great distances. Since then Dr. Scharff (3) has thrown doubt on the theory of a wholesale destruction of the pre-glacial flora of Great Britain and Ireland and refuted the idea of the introduction of the "Pyrenean" element by migrating or gale-driven birds. In my opinion the question of the presence of those peculiar elements and especially of the so-called "Atlantic," "Pyrenean" or "Lusitanian" plants has in a general way already been solved by Engler (4) in his 'Versuch einer Entwicklungsgeschichte der Pflanzenwelt' more than thirty years ago. To him their immigration or rather reimmigration took place in post-glacial times—for he too assumes the wiping out of the greater part of the pre-glacial flora during the Glacial period—and it

happened along with the repopulation of the eglaciated land by a flora advancing mainly from south-western Europe through western France, where the improvement of the climatic conditions following on the retreat of the ice in the north set in first. It might be sufficient to refer to the pages quoted from his book, if it were not for the brevity with which he was obliged to deal with the matter and for the fact that great confusion exists as regards the meaning of the terms "Atlantic," "Pyrenean" or "Lusitanian" plants and the place which these elements hold in the British flora and its history. I have therefore thought it useful to sort out from the British flora that constituent portion which from its distribution in Europe might justly be called "Atlantic," and to analyse it with regard to the relative continuity or discontinuity of the British and Continental areas of its members. In doing so it became evident, as was to be expected, that the "Atlantic" fraction of the flora could not be separated from another portion which whilst covering the Atlantic region extended beyond it into the Mediterranean region, of which it is a characteristic part. In fact they belong to the same Southern stock, but with this difference, that one is more specialized with respect to the conditions which determine the distribution of its members than the other. The scope of my analysis had therefore to be extended, so as to include both. The former are the "Atlantic" and the latter the "Mediterranean" types as understood in this essay.

I have not considered it necessary to enter into the question whether these Atlantic and Mediterranean types have survived the Glacial period in Great Britain and Ireland or whether their present habitats in those islands are post-glacial. Whether one accepts the "land-ice" or the "submergence" theory, both of which have been dealt with so admirably by Professor Bonney (5), the botanist cannot but assume that survival under the rigorous conditions postulated by both theories was impossible for most or probably all the plants under consideration. If in the future new facts should come to light which make the climatic conditions during the Glacial period appear more favourable for plant-life, the question of survival will have to be reconsidered; but at present I see no way out of the conclusions at which Mr. Reid, and, many years before him, Professor Engler have arrived.

The term "Atlantic type" was formulated by H. C. Watson in his 'Remarks on the Geographical Distribution of British Plants' in 1835. There on p. 86 he says: "The Atlantic type embraces species found in the south-west of England or Wales, sometimes very locally, sometimes extending far along the southern or western counties, but rare or wanting on the east coast. Some plants of very limited geographical extension are common to this part of Britain, the west of France and Portugal. *Erica ciliaris*, *Sibthorpia europæa*, *Euphorbia Peplis*, *Bartsia viscosa*, and *Pinguicula lusitanica* may be given as examples of the type." From the reference to France and Portugal it might be inferred that he

had in view the general extension of the areas of his Atlantic types over western Europe when introducing the term. But if he had it in view originally, he made it abundantly clear in 'Cybele Britannica' in 1847, that this did not hold good any longer. For he remarks here on page 51 of the first volume: "These species (*i. e.*, of the Atlantic type) correspond in the one circumstance of having some decided tendency to the western or Atlantic side of the island, in contradistinction to the eastern or Germanic side. *Although there may exist other reasons for especially denominating some of these the 'Atlantic species,' the name of the type will be here understood as having reference only to their distribution within Britain itself, and by itself.*" (The italics are mine.) This limitation of the term "Atlantic" to the circumstance of a western distribution *within Britain*—and the same applies more or less to the definitions of Watson's other types of distribution—was unfortunate in so far as it tended towards a one-sided conception of the British flora as a detached unit. His "types of distribution" may be in order in his scheme of topographical statistics; to some extent they are also expressive of certain ecological conditions that determine their limits. But if we try to make them the basis for working out the relation of the British flora to the floras of the European Continent, or for tracing its history, they break down. It is evident that for that purpose we have to treat it as a section of the flora of Western Europe whose history it has shared and out of which it has recruited itself. This was the standpoint of Edward Forbes (6) in his brilliant memoir "On the Connexion between the Distribution of the existing Fauna and Flora of the British Isles, and the Geological changes which have affected their area, especially during the epoch of the Northern Drift," published so long ago as 1846. To him the British flora was made up of 5 subfloras, all derived from different quarters of the European mainland. Two of them, the Asturian and the Gallican or Norman floras, correspond to Watson's "Atlantic type" (1835). Forbes enumerates the species which in his opinion belong to the Asturian flora. Reduced to the modern conception of those species they are nine in number. Of the "Norman" type he quotes merely examples, and so he also does for the "Kentish" or "North French" flora, which forms part of Watson's Germanic and English types, but is treated as a Southern type. These lists were drawn up rather loosely and being moreover incomplete they found practically no consideration in the numerous British local floras. They rather based their classifications into types of distribution on Watson's work, which had at least the advantage of definiteness and completeness.

More recently, in 1899, Mr. Clement Reid in his 'Origin of the British Flora' spoke of certain British plants as Iberian, Lusitanian and Pyrenean, whilst in his Portsmouth address he uses such terms as "Atlantic or Lusitanian plants," "Atlantic element," "Pyrenean element" and "Lusitanian flora" as if they were synonymous. No definition of the terms is given, but from

the half dozen names he quotes it appears that he meant species which outside the British Isles were, as he thought, confined to the Pyrenees or the North of Spain or the Iberian or Pyrenean peninsula generally.

So much as to Watson's term "Atlantic type" and the more loosely used descriptions Norman, Asturian, Iberian, Lusitanian and Pyrenean. But what, then, is that Southern element which undoubtedly is present in the British flora and has so early attracted the attention of British botanists by its peculiar distribution, mostly westward, frequently much interrupted and in many cases extremely limited? If we take a British flora, for instance the last edition (1904) of Babington's 'Manual,' and a flora of Germany, like Koch's 'Flora Germanica,' ed. III., whose area after the deduction of the Mediterranean districts in Switzerland and Austria and parts of the extreme West is practically that of Central Europe, and if we mark off in the British flora those species which are not recorded from Central Europe as defined, we obtain a rough list of the plants which do not partake in the composition of the flora of Central Europe. Of these a small number is peculiar to Northern Europe, or, outside Great Britain and Ireland, only known from North America; these may be struck off. If we further revise with the help of the latest floras the distribution of the species remaining on the list partly to exclude errors, and partly to add such British species as in isolated cases enter the Central European region either from their headquarters in the west or south, we shall have left an assemblage of about 150-160 * species (9 per cent. of the British flora), the European continental areas of which lie mainly along the west coast of Europe from Holland and Belgium or from Normandy to Spain and Portugal, or beyond those countries to Italy and even the Orient (Map 1, inset). They fall into two fairly distinct classes. That set which does not extend into the eastern Mediterranean region (Map 2, inset) may be called for the purposes of the paper the Atlantic element, the other the Mediterranean (Map 3, inset). The Atlantic element extends in Belgium and France more or less eastward, but crosses the Rhine or the Rhone only in exceptional cases. A few species referred to it reach North Italy, but outside the typically Mediterranean region. A few also extend along the west coast to Denmark or Norway, but they have in each case their main area farther south.

In my original paper the species of the "Southern Element" were grouped in three classes—namely:

1. Species generally found in and near cultivated land.
2. Species confined to the coasts (littoral species).
3. Species other than those referred to classes 1 and 2 (they might be termed translittoral or inland species).

* The species of *Rosa*, *Rubus*, and *Hieracium* have not been taken into consideration owing to the difficulty of a satisfactory collation of the species recognised by British and Continental authors.

The species generally found on and near cultivated land were not tabulated and they are not included in the maps of this paper. There are 13 of them. Of these 8 are species of *Fumaria*. Some of them and probably *Linaria supina* may be true natives in at least a part of the British Isles and might be transferred to class 3 where they would add to the Atlantic element. The remainder of the species of this class extends far into the Mediterranean region. No attempt has been made in this place to map the species of classes 2 and 3 separately. They are therefore represented collectively in the maps. It is, however, obvious that the inclusion of the littoral species contributes largely to the deeper shading of the coastal regions. To what extent this is the case will be seen in the following paragraphs.

The number of species recognised as "Southern" is 155 and of those of class 1 (in and near cultivated land) 13, so that 142 are included in map 1. Of these 66 are represented in the map of the Atlantic and 76 in that of the Mediterranean elements.

Southern Elements considered generally (Map 1).—The definition of "Southern Elements" as given on page 85 is illustrated very clearly in the inset of map 1, so that it appears unnecessary to enlarge on that point. Looking at the main map, we are struck by two features—the extreme concentration of the Southern elements in a narrow belt on the Channel Coast and their thinning out towards the interior, and in Great Britain also towards the north and north-east. The Channel belt would appear still narrower if it were feasible to map the Southern elements according to their actual areas instead of the vice-counties in which they occur, and the same applies to the littoral zones generally; but problems like the present, in which we have to deal with general phenomena and broad averages, are treated better on a wide basis. However, there is among the Southern element one class of plants which is tied to the coasts as such, and apart from climatic conditions. They are plants peculiar to sea-cliffs, sandy shores, salt marshes, &c. These "littorals," as we may call them briefly, share in the crowding of the Southern elements towards the coasts, and this share requires to be gauged correctly. They form almost exactly one-third (33·8 per cent.) of the total of the Southern elements. They are relatively more numerous—though only slightly so—in Great Britain than in Ireland, their percentages being 36 (48 out of 134) and 30 (24 out of 81) respectively. This preponderance is noticeable on all the coasts of Great Britain, but most marked on the East coast, where 41·3 per cent. of the Southern elements are littoral, the corresponding figures for the South and West being 35·25 per cent. and 34·3 per cent. In Ireland, on the other hand, the eastern and western coasts have about equal shares in littoral Southern elements. Consequently, if we were to exclude this littoral class, we should see the blank area in the north and north-east of Great Britain (map 1) expand very much towards the south, particularly on the east coast, while some of the hatched shading of the coastal zones would pass into

stippled shading. The significance of the high percentage of littorals on the East coast of Great Britain becomes still more manifest if we consider that this region is at the same time the poorest in Southern, numbering 75 out of the total of 134 (56 per cent.) against 102 (76 per cent.) for the West and 122 (91 per cent.) for the South. That is, the eastern zone is not only least endowed with Southern, but owes much of its share in that element to the presence of littorals, many among them moreover species of wide distribution. However much the shading in map 1 would generally be toned down by the exclusion of littorals, the relative unevenness of the distribution of the Southern in Great Britain as compared with Ireland would not only be maintained but distinctly enhanced. That is only what might be expected from the geographical positions and the sizes of the two islands.

There is one more aspect in the diffusion of the Southern in the British Isles which is not directly deducible from the map, namely the relative share of the floras of each island in Southern computed on the number of species of each flora. Of the 142 Southern 134 are found in Great Britain and 81 in Ireland, which, expressed in percentages of the two floras, works out at about 9 per cent. of each of them, or, if we distinguish between the English and Scottish floras, at 9 per cent. (English) and 5·3 per cent. (Scottish).

Atlantic Elements (Map 2).—The character of the Atlantic elements as a well-defined type of distribution is so clearly demonstrated in the inset map that it calls for no special comment. The main map shows the Atlantic element strongly represented in the South of England, but the zone of maxima also extends without interruption northwards along the west coast as far as Anglesea, thus connecting the small detached Welsh maxima zone of map 1 with the southern belt. The Atlantic element is still numerous farther north on the same coast as far as the Clyde and the Island of Mull. Further, a zone rich in it skirts the whole of the southern half of Ireland, whilst two smaller detached areas marked black in the map point to a junction with the south-west of Scotland and Westmoreland. Inland, and in England north and eastwards, the Atlantic plants become less numerous, but they nowhere sink to the level marked by blanks.

Numerically the total of the Atlantic species amounts to 45·8 per cent. of the Southern element, but they are so distributed over Great Britain and Ireland that they are relatively less numerous in the larger island (44·75 per cent.) than in the smaller (55·25 per cent.). Thus they predominate among the Southern of Ireland. These figures include the littorals, which are represented in Great Britain as well as in Ireland in the proportion of two Atlantics to three Mediterraneans. If we eliminate them the preponderance of the Atlantic strain in Ireland becomes still more marked. It rises to 61 per cent., the corresponding figure for Great Britain being 47·7 per cent.

Mediterranean Elements (Map 3).—Here again the inset map speaks for itself. The Mediterranean element is, as is evident from the main map, much more restricted than the Atlantic (see map 2). There is still the maximum belt in the Channel zone; but it extends nowhere beyond it. Towards the north it gives out rapidly in the east and also in the west; in Ireland the percentage rises to the 25–39 per cent. level only in the extreme south-west and south-east. The whole of the interior of Ireland and almost the whole of Scotland are below the 12 per cent. share, and consequently appear as blanks in the map. The predominance of the Mediterraneans (54·2 per cent.) over the Atlantics in the British Isles and their inferiority in Ireland (44·75 per cent., or, if the littorals are eliminated, 39 per cent.) is implied in the analysis of the Atlantic element given above.

Interlacing of the Atlantic and Mediterranean Elements.—This problem does not lend itself to cartographic illustration without the addition of a considerable number of maps. As this is out of question, I may be permitted to reprint some of my observations on pp. 521–524 of my original paper.

(p. 521) “Seven of the littorals are generally diffused along the coast of Great Britain and Ireland. Of these three are Atlantic and four Mediterranean, whilst one of each class is absent in Ireland, although widely distributed in Great Britain. They are *Limonium vulgare* and *Atropis rupestris*.”

(pp. 522–524; the following observations deal exclusively with “translittorals,” called “non-littorals” in the original paper.)

“Generally distributed through both islands, or the greater part of both, are *Hypericum Androsceum*, *Ilex Aquifolium*, *Ulex europæus*, *Apium nodiflorum*, *Conopodium majus*, *Oenanthe crocata*, *Carduus pycnocephalus*, *Erica Tetralix*, *E. cinerea*, *Scilla non-scripta*, and, general in Great Britain but much restricted in Ireland, *Corydalis claviculata*. This means that the Atlantic element is very prominent among the most widely diffused of the southern species, and its predominance appears still more marked if we take into consideration that the general presence of the Mediterranean *Apium nodiflorum* and *Carduus pycnocephalus* is probably due to their great facilities for extending their area, the former as an aquatic, the latter as a waste land plant. The absence in Ireland of a plant very widely spread in Great Britain, *Genista anglica*, an Atlantic species, is very remarkable, and to it might be added *Tamus communis*, so common in England and yet doubtful as a native in Ireland. On the other hand, widely distributed in England and Ireland are *Lepidium heterophyllum*, *Hypericum elodes*, *Ulex Gallii*, *Cotyledon Umbilicus* and *Sedum anglicum*, all but one Atlantic members of the Southern element. Another group of species of fairly wide distribution is worth noting on account of the fact that they are absent from the greater part of the eastern counties of England, but extend through North England and Scotland to the north-east coast. They are *Vicia Orobus*, *Saxifraga hypnoides*, *Scilla verna*, *Hymenophyllum tun-*

bridgense, *H. peltatum*, and *Lastrea cernua*, all Atlantic species which are also found in Ireland. The Atlantic element is also prevalent among the few southern species which are confined to the western part of Great Britain, *Meconopsis cambrica*, *Arabis stricta*, *Helianthemum guttatum*, and *Trichomanes radicans*, of which the last but one is the only Mediterranean element.

"If we turn to the remainder of the more limited* species of the southern stock (excepting those which are confined to Ireland) we find the Mediterranean element dominant, there being 33 of it against 18 of the Atlantic type. They range as follows:—

Confined in Great Britain to	Extending to Ireland.
West 3 (Atl. 2, Med. 1)	2 (Atl. 1, Med. 1)
West and South 13 (Atl. 5, Med. 8)	9 (Atl. 3, Med. 6)
South 25 (Atl. 9, Med. 16)	3 (Atl. 2, Med. 1)
South and East (mostly to Norfolk). 3 (all Med.)	
West, South and East (to Norfolk) . 10 (Atl. 4, Med. 6)	2 (Atl. 1, Med. 1)

"Pembroke in the west and Norfolk in the east mark off a zone which is particularly rich in Mediterranean forms, the maximum of them occurring in the Cornish peninsula. It is characteristic that of the 25 southern species confined to the south of England only three reach Ireland, and two of those are Atlantic, namely *Euphorbia hiberna* and *Simethis planifolia*.

"The southern species which are generally diffused through Ireland and, at the same time, Great Britain have already been enumerated. To them have to be added *Cotyledon Umbilicus* and *Lastrea cernua* as general in Ireland, but more restricted in Great Britain. The majority of them (7) are Atlantic. So are also, with a single exception, the following ten species, each of which is recorded from 16 to 30 of Praeger's divisions: *Lepidium heterophyllum*, *Hypericum elodes*, *Erodium moschatum*, *Ulex Gallii*, *Sedum anglicum*, *Rubia peregrina*, *Scutellaria minor*, *Orobanchae Hederae*, *Iris foetidissima*, *Hymenophyllum tunbridgense*.

"Among the species with more restricted distribution in Ireland the Mediterranean element gains in number, but it nowhere outnumbers the Atlantic, as it does in the southern counties of England, the nearest approach to equalisation being in Cork West. The Atlantic share of the Southern element predominates therefore over the Mediterranean throughout Ireland. The main area of the southern portion of the Irish flora with 18 to 29 species per division is in the south, then in the west as far as Galway, and in the east as far as Dublin. In the extreme south-west (Kerry and

* Recorded in the 'London Catalogue' from 1-25 vice-counties. I count 51 species as belonging to this class.

Cork West) the Atlantic forms number 18 to 21 species per division, whilst the remaining divisions in the south, the western to Mayo West, and the eastern to Dublin, count 12 to 17 of them. The bulk of the Mediterranean species shows a similar distribution, although their number is, as we have seen, much smaller."

Ecological differentiation of the Southern Element.—In my original paper I have attempted to characterise approximately the ecological character of the conditions under which the plants are found in the more southern main-portions of their area. If we classify the Southern element on that basis, distinguishing between its Atlantic and Mediterranean components, a very striking result is obtained, so striking indeed that no reference to the inherent crudeness of this classification can upset it. It reveals a deep and very general contrast between the hygrophilous species which inhabit bogs or boggy places, wet meadows or wet rocks and heaths on one side, and the more xerophilous tenants of light, open soil. Of the 33 species referable to the hygrophilous type all but two are Atlantic; of the 50 species of the xerophilous group, all but eight are Mediterranean. These xerophiles are to two fifths littoral, but the proportion of Atlantics and Mediterraneans among them is practically the same. Among the cliff and rock plants, and then again among the plants found in woods or bush formations, the Mediterraneans outnumber the Atlantics slightly. The same is the case among the aquatic and semi-aquatic inland-plants, whilst the two elements are exactly balanced among the Southern elements of the littoral salt marshes.

British and Continental areas.—A glance at the inset maps (1-3) shows the practical continuity of the British and Continental areas inhabited by the Southern elements as a whole and also by each of its components. It is true the English and the Irish Channels cut into it, but they are not able to interrupt the natural trend of the belt of Southern elements that skirts the Bay of Biscay. The Straits of Dover have opened the door to the Southern littorals, many of which have thus been enabled to creep round the south-eastern corner of England and up the east coast, whilst the general softening of the climate due to the separation from the continent has favoured a similar influx of Southern of the inland type in the same direction. The continuity of the group areas, whether Southern, Atlantic, or Mediterranean, is reflected in the majority of the individual areas of which they are built up. Among the littorals this is true of all but 3 species, and among the translittorals of not less than 85 per cent. They are separated from the continental areas only by the width of the Channel plus their distances from the Channel, distances which lie over land except in the case of the Irish plants. Instances of a high degree of continuity of area, and at the same time very typical of each of the component classes of Southern, are shown in map 4 (*Corydalis claviculata*)* and map 5 (*Rubia peregrina*).

* In this paragraph the Atlantic species are printed in spaced-out type.

Of the minority with pronounced discontinuity of area the following have to be mentioned: the distribution of some of them is illustrated by maps (6-11), which have been so selected as to show increasing degrees of discontinuity. *Erica ciliaris* (map 6) inhabits only 3 small much separated areas in the British Isles, but their connection with its wide continuous continental area is quite clear. *Simethis bicolor* (map 7) with 2 small detached areas in the British Isles is linked to its extensive continental area by an outpost on the lower Seine. *Arbutus Unedo* (map 8) with its solitary Irish area is similarly joined to its continental area—though the gaps are wider—by its station in the Côte du Nord. *Euphorbia hiberna* has its northern limit in the department of the Sarthe, *Daboecia Polifolia* (map 9) in that of the Maine et Loire, both in the latitude of Brittany, but to the east and south of the peninsula; *Echium plantagineum* in the Vendée; *Mathiola incana* and *Atropis Foucaudii* in the Charente Inférieure; *Erica mediterranea* in the department of the Gironde. A further step of less than 2 degrees brings us to the latitude of the Pyrenees and the Asturian mountains, which harbour a number of plants whose British stations are the only ones north of that latitude. They are *Arabis stricta*, *Hypericum undulatum*, *Saxifraga Geum* and *S. umbrosa*, *Physospermum cornubiense*, *Pinguicula grandiflora*, *Erica Mackaii* (map 10), *Neotinea intacta* (map 11) and *Trichomanes radicans*. It is this small group which with some justification might be designated as “Pyrenean” or “Cantabrian,” although *Physospermum cornubiense* and *Neotinea intacta* have a wide range in the Mediterranean countries. *Arabis stricta* inhabits a very much broken-up area in Southern France (from the Pyrenees to Savoy) and in Spain. *Hypericum undulatum* is considered by some botanists as approaching so closely to the widely distributed *H. quadrangulum* that it is treated by them as a western variety of it. *Trichomanes radicans* occurs in the warm regions of both hemispheres, and is evidently a relict of very great age. Like the remaining species of the group it fits very naturally into the assemblage of Atlantic plants in the British Isles. Apart from the so-called North American species, the remaining four species *Saxifraga Geum* and *S. umbrosa*, *Pinguicula grandiflora* and *Erica Mackaii* are often quoted as the most puzzling instances of distribution among the British plants, and they have attracted the more attention, as they are, within the British Isles, confined to the extreme south-west and west of Ireland. The anomalies of their distribution are, however, more apparent than real, and, considered side by side with the distribution of the other members of the Southern stock, they resolve themselves into cases of far-gone disintegration of area. How this has come about, or how the Atlantic and Mediterranean elements of the British flora have arrived in their island home, is a question which cannot be dealt with in this place.

LITERATURE.

- (1) CLEMENT REID in Report Brit. Assoc. Portsmouth, 1911, pp. 573-577.
- (2) O. STAFF, *ibid.* p. 578.
- (3) R. F. SCHARFF in 'The Irish Naturalist,' 1912, pp. 105-111.
- (4) A. ENGLER, Versuch einer Entwicklungsgeschichte der Pflanzenwelt, vol. i. pp. 176-182.
- (5) T. G. BONNEY, Presidential Address in Report Brit. Assoc. Sheffield, 1910, pp. 3-34.
- (6) E. FORBES in Mem. Geol. Survey of Great Britain, vol. i. pp. 336-342.

EXPLANATION OF THE PLATES.

PLATE 1.

Fig. 1. The Distribution of British Plants: Southern Element.

PLATE 2.

Fig. 2. The same; Atlantic Element.

PLATE 3.

Fig. 3. The same; Mediterranean Element.

PLATE 4.

Fig. 4. *Corydalis claviculata*, DC.

5. *Rubia peregrina*, Linn.

6. *Erica ciliaris*, Linn.

7. *Simethis bicolor*, Kunth.

PLATE 5.

Fig. 8. *Arbutus Unedo*, Linn.

9. *Daboecia Polifolia*, D. Don.

10. *Erica Mackaui*, Hook.

11. *Neotinea intacta*, Reichb. f.



Fig. 1.—The Distribution of British Plants.



Fig. 2.—The Distribution of British Plants.

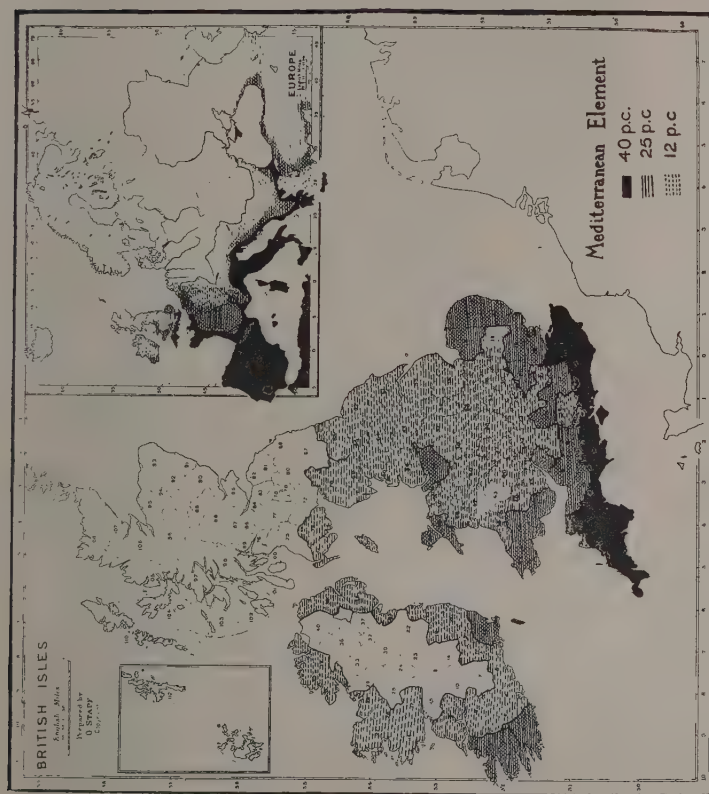


Fig. 3.--The Distribution of British Plants.



Fig. 4. *Corydalis claviculata*.



Fig. 5. *Rubia perigrina*.

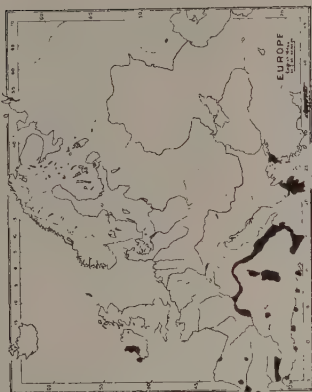


Fig. 6. *Erica ciliaris*.



Fig. 7. *Simethis bicolor*.

Maps showing discontinuity of area
in certain species.

Fig. 9. *Daboecia Polifolia*.Fig. 11. *Neotinea intacta*.Fig. 8. *Arbutus Unedo*.Fig. 10 *Erica Mackaii*.

Maps showing discontinuity of area
in certain species.

*List of published Portraits of Sir JOSEPH HOOKER,
O.M., G.C.S.I., C.B.*

1851.

1. T. Q. L., seated, vignette; drawn and lithographed by T. H. Maguire (Ipswich Series).

1852.

2. Picture in the Himalayas of natives bringing in plants, painted by Frank Stone, A.R.A.; in possession of Major Joseph Symonds Hooker.
Engraved by William Walker.
Reduced woodcut in "Leisure Hour," August 1, 1868.

1855.

3. Head and shoulders; drawn by George Richmond, photographed by W. Dennis Moss; in possession of Charles Paget Hooker, Esq.

1868.

4. Head to right, from photograph by Mrs. Julia Margaret Cameron; half-tone reproduction in Proc. Linn. Soc., 1911-12; reprinted in Oliver's "Makers of British Botany," pl. 26, p. 302.
5. Head to left; woodcut from photograph by H. T. Whitlock, Birmingham, in the "Leisure Hour," August 1, 1868, p. 521.

1870.

6. Head to left; photographed by G. C. Wallich for his "Eminent Men of the Day," pl. 6. Woodcut in "Harper's Magazine," lxix. 1884, p. 833, and "Harper's Weekly," xxviii. 1884, p. 555; half-tone block in Darwin & Seward, "More Letters of Charles Darwin," i. p. 316.

1874.

7. Head to right; drawn and engraved on wood by W. G. Smith, published in the "Graphic," January 3, 1874, p. 8.

1878.

8. Head to right, from a photograph, engraved in stipple by C. H. Jeens, published in "Nature," October 25, 1877, with notice by Asa Gray, pp. 537-539. (Scientific Worthies, No. XI.)

1881.

9. Head and bust, to right; painted by the Hon. John Collier; in possession of the Royal Society.

1886.

10. H. L., seated at table with microscope, drawn for the "Graphic" by T. B. Wigram in 1886. Original pen-and-ink drawing now at Kew.

1890.

11. T. Q. L., seated; painted by Sir H. von Herkomer, R.A.; in possession of the Linnean Society. A replica in possession of Lady Hooker.

Collotype reproduction by Annan & Swan, 12 in. by 10 in. Half-tone, Supplement to "Gardeners' Chronicle," Ser. III. xxxvii. (1905) p. 8, and reprinted in Ser. III. l. (1911) p. 436; 8 in. by 6 $\frac{3}{4}$ in.

1895.

12. T. Q. L., seated; photogravure in "More Letters of Charles Darwin," ii. p. 242, from a photograph by Hawker, of Bournemouth.

Head, enlarged, from the original negative photograph, Darwin-Wallace Celebration Report, pl. 5, 1908.

1897.

13. T. Q. L., seated; photogravure published by Walker & Cockerell.

1898.

14. Head to left, Bronze Medallion, original model by Frank Bowcher for obverse of Hooker Medal; in possession of the Linnean Society of London; cf. half-tone in Proc. Linn. Soc., 1897-98, p. 61.

1908.

15. Photograph in "The Gardener," 26th September, 1908; republished 23rd September, 1911.

1911.

16. Marble bust, modelled from life in 1911 by Pennachini, and presented by Lady Hooker in 1913 to the Royal Botanic Gardens; placed in No. 1 Museum.

1912.

17. Head and bust, half-tone, in "Kew Bulletin," 1912, frontispiece, from photograph by Elliott & Fry, Ltd.

1913.

18. Medallion in Kew Church, by Frank Bowcher, in Wedgwood cameo-ware, the centre of a memorial erected by Lady Hooker; see "Gardeners' Chronicle," 15th March, 1913, p. 171.

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19. Medallion by Frank Bowcher, in Westminster Abbey.

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1883.

Sir John Lubbock, Bt. (afterwards Lord Avebury).

Portrait of Carl von Linné, ascribed to M. Hallman.

Philip Henry Gosse, Esq.: towards cost of illustrating his paper, £25.

Royal Society: Grant in aid of Mr. P. H. Gosse's paper, £50.

Sophia Grover, Harriet Grover, Emily Grover, and Charles Ehret Grover: 11 letters from Carl von Linné to G. D. Ehret.

1885.

Executors of the late George Bentham, £567 11s. 2d.

Subscription portrait of George Busk, by his daughter Marian Busk.

1886.

A large selection of books from the library of the late Dr. Spencer Thomas Cobbold (a bequest for a medal was declined).

Sir George MacLeay, Bt.: MSS. of Alexander MacLeay and portrait of Rev. William Kirby.

1887.

William Davidson, Esq.: 1st and 2nd instalments of grant in aid of publication, £50.

Francis Blackwell Forbes, Esq., in aid of Chinese Flora, £25.

1888.

The Secretary of State for India in Council: Grant in aid of publication of results of the Afghan Boundary Delimitation Expedition, £150.

Dr. J. E. T. Aitchison, towards the same, £25.

Trustees of the Indian Museum: Mergui Archipelago report, for publication in Journal, £135.

Dr. John Anderson, for the same, £60.

Wm. Davidson, Esq.: 3rd and last instalment, £25.

Sir Joseph Hooker: (1) Series of medals formerly in possession of George Bentham; (2) Gold watch, key, and two seals which belonged to Robert Brown.

1889.

Bronze copy of model for Statue of C. von Linné, by J. F. Kjellberg; presented by Frank Crisp, Esq.

1890.

The Secretary of State for India in Council: Grant for Delimitation Expedition report, £200.

Oak table for Meeting Room, presented by Frank Crisp, Esq.

Subscription portrait of Sir Joseph Dalton Hooker, K.C.S.I., by Hubert Herkomer, R.A.

Executors of the late John Ball, Esq.: a large selection of books.

An anonymous donor, £30.

Colonel Sir Henry Collett, K.C.B., towards the publication of his Shan States collections, £50.

1891.

Subscription portrait of Sir John Lubbock, Bt. [Lord Avebury], by Leslie Ward.

George Frederick Scott Elliot, Esq., towards cost of his Madagascar paper, £60.

1892.

Dr. Richard Charles Alexander Prior: for projection lantern, £50.

1893.

The Executors of Lord Arthur Russell: his collection of portraits of naturalists.

Electric light installation: cost borne by Frank Crisp, Esq.

1894.

Algernon Peckover, Esq.: Legacy, £100 free of Duty.

Miss Emma Swan: "Westwood Fund," £250.

1896.

Clock and supports in Meeting Room, presented by Frank Crisp, Esq.

1897.

William Carruthers, Esq.: Collection of engravings and photographs of portraits of Carl von Linné.

Royal Society: Grant towards publication of paper by the late John Ball, £60.

Subscription portrait of Professor George James Allman, by Marian Busk.

1898.

Sir John Lubbock, Bt.: Contribution towards his paper on Stipules, £43 14s. 9d.

Royal Society: Contribution towards F. J. Cole's paper, £50.

" " " " Murray & Blackman's paper, £80.

" " " " Elliot Smith's paper, £50.

" " " " Forsyth Major's paper, £50.

1899.

Alfred Charles William Harmsworth, Esq. [afterwards Lord Northcliffe]: Contribution towards cost of plates, £43.

Royal Society: Contribution towards Mr. R. T. Günther's paper on Lake Urmi, £50.

1901.

Hon. Charles Ellis, Hon. Walter Rothschild, Frank Crisp, Esq., F. D. Godman, Esq., and the Bentham Trustees: The Correspondence of William Swainson.

Royal Society: Contribution towards Mr. F. Chapman's paper on Funafuti Foraminifera, £50.

Prof. E. Ray Lankester: Contribution towards illustration, £30 5s.

Portrait of Dr. St. G. J. Mivart, presented by Mrs. Mivart.

1903.

Royal Society: Contribution toward Dr. Elliot Smith's paper, £50. Legacy from the late Dr. R. C. A. Prior, £100 free of duty.

Mrs. Sladen: Posthumous Portrait of the late Walter Percy Sladen, by H. T. Wells, R.A.

B. Arthur Bensley, Esq.: Contribution to his paper, £44.

1904.

Royal Society: Grant in aid of third volume of the Chinese Flora, £120.

Frank Crisp, Esq. (afterwards Sir Frank Crisp, Bt.): Cost of Supplementary Royal Charter.

The same: Bulliard (P.). *Herbier de la France; Dictionnaire; Histoire des plantes vénéneuses; Champignons*, in 10 vols. Paris, 1750-1812.

1905.

Royal Society : First grant in aid of Dr. G. H. Fowler's 'Biscayan Plankton,' £50.

Executors of the late G. B. Buckton, Esq. : Contribution for colouring plates of his paper, £26.

1906.

Royal Society : Second grant towards 'Biscayan Plankton,' £50.

Subscription portrait of Prof. S. H. Vines, by Hon. John Collier.

Royal Swedish Academy of Science : Copies of portraits of C. von Linné, after Per Kræfft the elder, and A. Roslin, both by Jean Haagen.

1907.

Royal University of Uppsala : Copy by Jean Haagen of portrait of C. v. Linné, by J. H. Scheffel (1739).

Royal Society : Third and final grant towards 'Biscayan Plankton,' £50.

The Trustees of the Percy Sladen Memorial Fund : First grant towards publication of Mr. Stanley Gardiner's Researches in the Indian Ocean in H.M.S. 'Sealark,' £200.

1908.

Prof. Gustaf Retzius : Plaster cast of bust of Carl von Linné, modelled by Walther Runeberg from the portrait by Scheffel (1739) at Linnés Hammarby ; the bronze original designed for the façade of the new building for the Royal Academy of Science, Stockholm.

Miss Sarah Marianne Silver (afterwards Mrs. Sinclair), F.L.S. : Cabinet formerly belonging to Mr. S. W. Silver, F.L.S.

1909.

The Trustees of the Percy Sladen Memorial Fund : Second grant towards publication of Mr. Stanley Gardiner's Researches in the Indian Ocean in H.M.S. 'Sealark,' £200.

Prof. James William Helenus Trail, F.R.S., F.L.S. : Gift of £100 in Trust, to encourage Research on the Nature of Proto-plasm.

1910.

Royal Society : Grant towards Dr. G. H. Fowler's paper on Biscayan Ostracoda, £50.

Sir Joseph Hooker : Gold watch-chain worn by Robert Brown, and seal with portrait of Carl von Linné by Tassie.

Prof. J. S. Gardiner : Payment in aid of illustrations, £35 *vs. 6d.*

Sir Frank Crisp : Donation in Trust for Microscopical Research, £200.

The Trustees of the Percy Sladen Memorial Fund : Third grant towards publication of Prof. Stanley Gardiner's Researches in the Indian Ocean, £200. (For third volume.)

1911.

The Trustees of the Percy Sladen Memorial Fund: Second Donation towards the publication of the third volume on the Indian Ocean Researches, £70.

The same: First Donation towards the fourth volume, £130.

1912.

The Indian Government: Contribution towards the illustration of Mr. E. P. Stebbing's paper on Himalayan *Chermes*, £46 15s. 2d.

The late Mr. Francis Tagart, £500 free of Legacy Duty.

The late Sir Joseph Dalton Hooker, O.M., G.C.S.I., £100 free of Legacy Duty.

The Trustees of the Percy Sladen Memorial Fund: Second Donation towards the publication of the fourth volume on the Indian Ocean Researches, £140.

The same: First Donation towards the fifth volume, £60.

1913.

Royal Society: Grant towards Dr. R. R. Gates's paper on Mutating *Oenotheras*, £60.

Sir Frank Crisp, Bt., Wallichian Cabinets, £50.

The Trustees of the Percy Sladen Memorial Fund: Second Donation towards the publication of the fifth volume, £200.

1914.

Royal Society: Grant towards Miss Gibbs's paper on the Flora of British North Borneo, £50.

Miss Foot: Cost of illustration of her paper on *Euschistus*.

The Trustees of the Percy Sladen Memorial Fund: Third Donation towards the fifth volume, £10.

The same: First Donation towards the sixth volume, £190.

1915.

The Trustees of the Percy Sladen Memorial Fund: Second Donation towards the sixth volume, £80.

Miss Foot: Cost of second paper on *Euschistus*, £32 10s.

Royal Society: Donations towards the cost of a paper by Mrs. Arber, D.Sc., £40.

The same: towards paper on Utakwa River plants by Mr. H. N. Ridley, C.M.G., F.R.S., £50.

Miss Marietta Pallis: Instalment of cost of her paper on *Plav*, £30.

Thomas Henry Riches, Esq.: Dr. A. R. Wallace's library on Natural History.

Sir Frank Crisp, Bt.: New shelving for Wallace's Volumes.

1916.

- Mr. E. Heron-Allen : Contribution to cost of paper on Foraminifera of N.W. Scotland, £44.
- Messrs. H. Takeda and C. West : Contribution towards the illustration of their paper, £40.
- Royal Society : Contribution towards the illustration of two papers by Prof. Dendy, £40.
- The same : Contribution towards Mr. Swynnerton's paper on Form and Coloration, £70.
- The High Commission for the Union of South Africa, per Dr. J. D. F. Gilchrist, for the illustration of his paper on *Jasus Lalandii*, £30.
- Miss Marietta Pallis : Balance of cost of her paper on Plav, £90 16s. 6d.
- Sir Frank Crisp, Bt. : Phototyped copy of Dioscorides from the 'Codex Aniciæ Julianæ' at Vienna.

1917.

- British Ornithologists' Union, etc. : Contribution towards cost of Mr. H. N. Ridley's paper, £20.
- The Royal Society : Contribution towards the printing of Mr. C. F. M. Swynnerton's paper on Protective Coloration, £75.
- Sir Frank Crisp, Bt. : 'Lindenia,' Ghent, 1891-1901. 17 vols. sm. fol.
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